Ministry of Energy, Mines and Petroleum Resources
Honourable Jack Waisgerber, Minister

ANNUAL REPORT

ENGINEERING & INSPECTION BRANCH

1990

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Ministry of Energy, Mines and Petroleum Resources
Mineral Resources Division

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ENGINEERING AND INSPECTION BRANCH

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FOREWORD

History of Reporting

The Engineering and Inspection Branch was established in 1877. By a century later, the information in the ministry's annual reports had grown so large that it became unmanageable in one volume. Rather than reduce the level of reporting, however, the Ministry chose to divide the material into several publications.

Between 1975 and 1988, the Engineering and Inspection Branch reported in the publication entitled Mining in British Columbia. In 1989, the material was re-arranged and the title of the publication changed to the Annual Report of the Engineering and Inspection Branch, to more clearly reflect the scope and content of the material presented.

The 1990 report of the Engineering and Inspection Branch has been produced by Yorkshire Resources, from data prepared by Branch staff and information from the private sector.

Other Helpful Publications

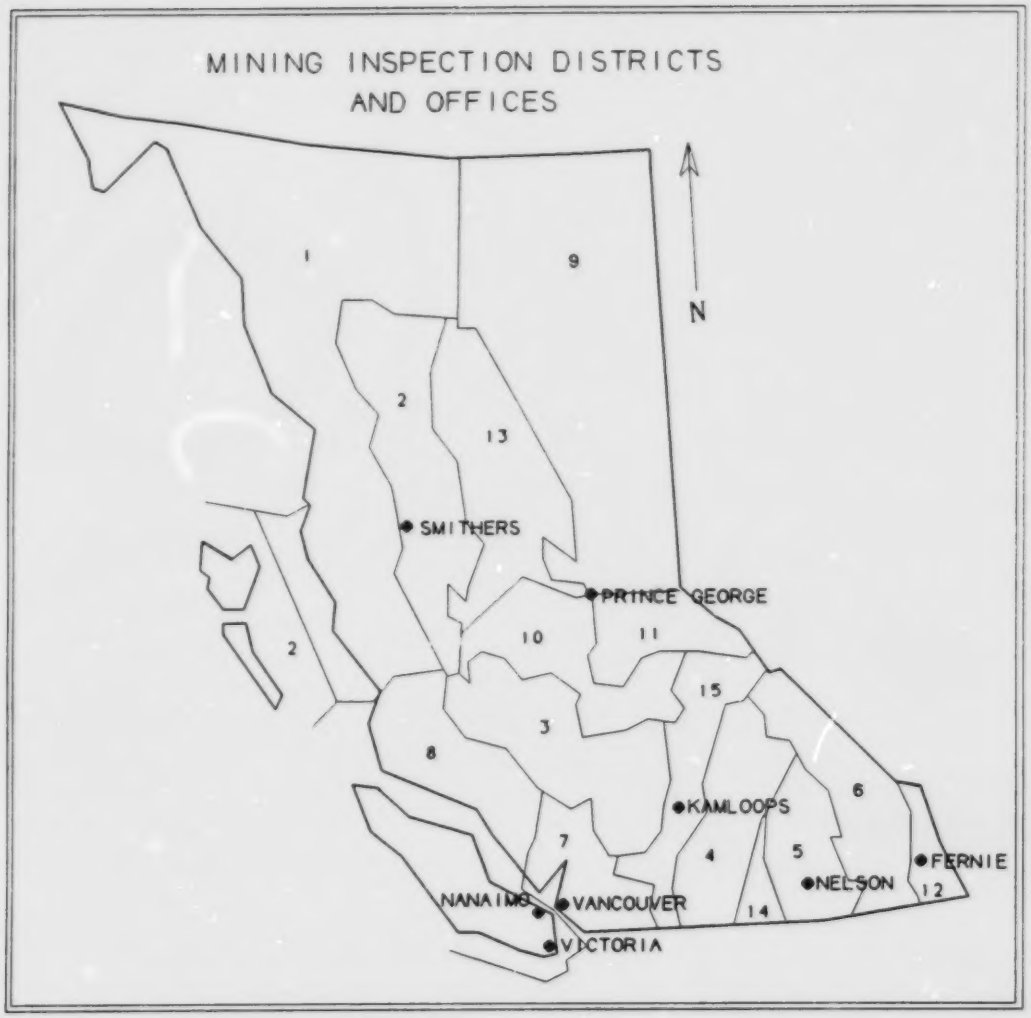
The Ministry of Energy, Mines and Petroleum Resources issues an overall annual report on the sector activities under its mandate: mineral, petroleum, and energy resources.

Those interested in the mineral sector may also wish to subscribe to Mineral Market Update, produced quarterly, which provides information on mineral markets, mining operations, exploration activities and projects in the Mine Development Review Process, as well as maps showing the location of major operating mines and exploration/development projects in the province. The Ministry also produces British Columbia Mine Statistics, annual summary tables giving historical mineral production to the present. Detailed descriptions of new provincial mineral exploration projects are provided in the annual information circular, British Columbia Mineral Exploration Review.

A catalogue of the Ministry's other publications and help in ordering is available through the various outlets of Crown Publications.

Further information on the activities of the various mining companies can be found in the Canadian Mines Handbook published each year by Northern Miner Press Limited. In addition, the Mining Association of British Columbia and the Coal Association of Canada each issues annual reports on the status of those sectors.

MAP 1.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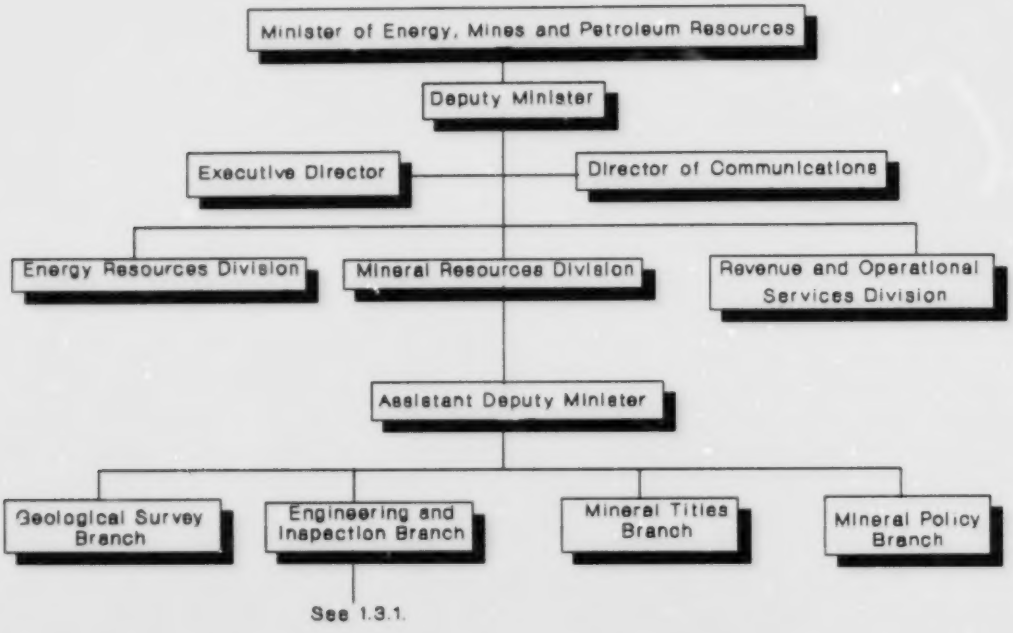
PART 1: BRANCH OVERVIEW

1.1. INTRODUCTION

1.1.1. Branch Position within the Ministry



1.1.2. Branch Mandate

The activities of the Engineering and Inspection Branch aim to fulfil three major areas defined in the Branch mandate:

1. To ensure worker health and safety, public safety, and suitable reclamation and protection of the land and watercourses affected by mining and exploration work.

2. To monitor mining activity to ensure optimum resource extraction.

3. To facilitate and expedite sound, publicly acceptable mining ventures by sponsoring a comprehensive, credible and widely understood project review and approval process.

1.1.3. Branch Functions

Key functions of the Engineering and Inspection Branch in carrying out its mandate are:

1. Administering the Mine Development Review Process (M.D.R.P.).

2. Issuing mining and exploration approvals and reclamation permits.

3. Conducting mine inspections and monitoring mining activity for conformance with the *Mines Act.*

4. Collecting data and maintaining records.

The Branch also participates in various special projects to further research and increase knowledge in all aspects of its mandate.

The responsibilities of the Branch have increased in recent years due to the addition of the Mine Development Review Process in 1988. Furthermore, permitting procedures have become more complex to keep pace with new environmental and land use issues, and new technologies continue to change mining activity.

1.1.4. Branch Address

The Branch mailing addresses and telephone numbers in Victoria and Vancouver are given below. (For the addresses and telephone numbers of Regional Offices see Section 4.)

Victoria:
105-525 Superior Street, Victoria, B.C., V8V 1X4.

Tel: (604) 387-3781
Fax: (604) 387-5985

Vancouver:
904-865 Hornby Street, Vancouver, B.C., V6Z 2G3.

Tel: (604) 660-9363.
Fax: (604) 660-2653

1.2. LEGISLATION

1.2.1. Mandatory Legislation

The Engineering and Inspection Branch derives its mandate from the *Mines Act* (1989), the Health, Safety and Reclamation Code for Mines in British Columbia (1990), and in regard to the Mine Development Review Process, the working policy of the Environment and Land Use Committee of Cabinet (E.L.U.C.).

1.2.2. Changes to Legislation

In July, 1989, a new *Mines Act*, Bill 56 (1989) received Third Reading in the House. This Act provides for the replacement of the Mines Regulation and the Coal Mines Regulation by the Health, Safety and Reclamation Code. Bill 56 and the Mine Code were Proclaimed July 15, 1990.

The Code is divided into eleven parts:

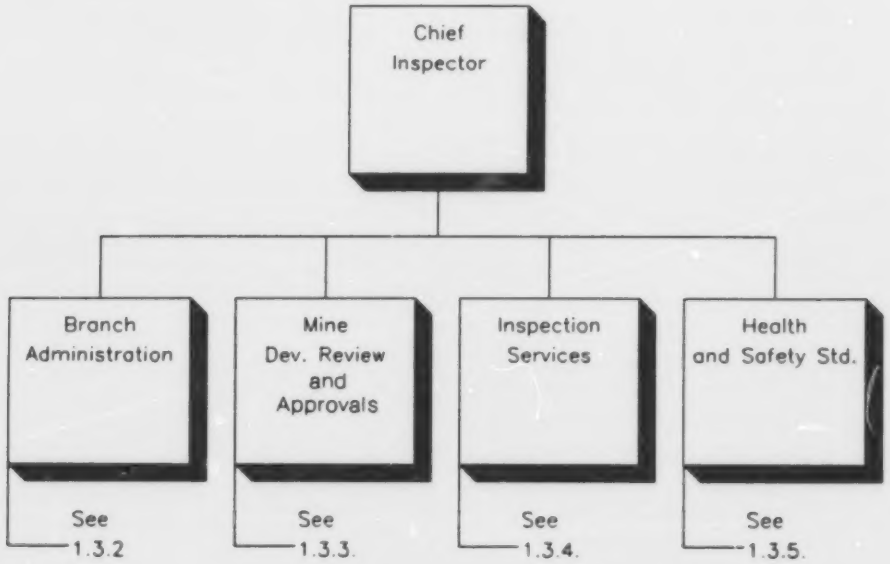
1. General Rules
2. Industrial Hygiene
3. Emergency Procedures
4. Buildings, Machinery and Equipment
5. Electrical Power Systems
6. Mine Design and Procedures
7. Hoists and Shafts
8. Explosives
9. Dams and Waste Emplacements
10. Reclamation and Abandonment
11. Exploration.

The staff of the Engineering and Inspection Branch was actively involved in drawing up the new Code. A Steering Committee, comprising representatives from labour, industry and government, and chaired by the Chief Inspector, produced the final draft which was distributed to concerned parties for final input prior to Proclamation. The Steering Committee will review and revise the Code annually to ensure it remains current with regard to new technology and mining practices.

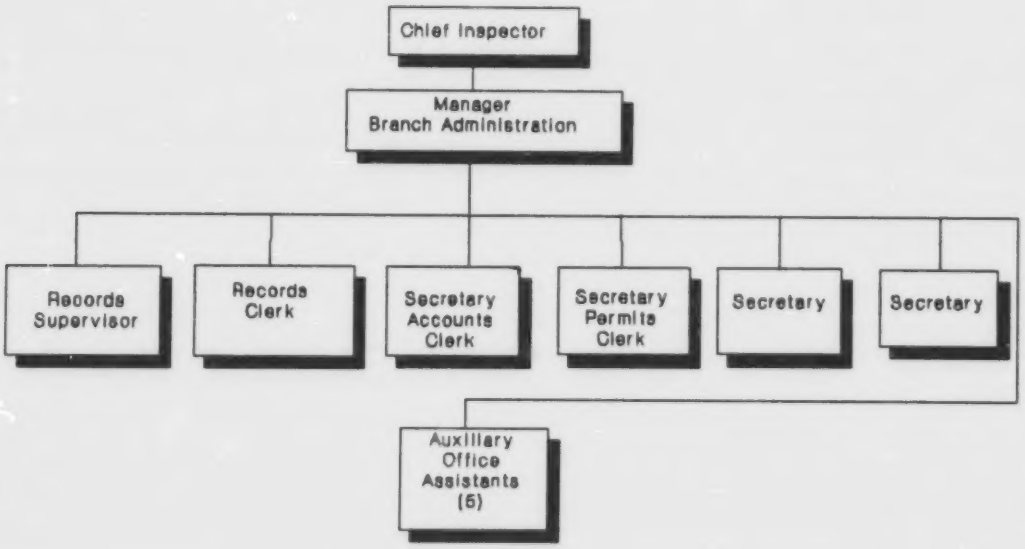
In July 1990, the *Mine Development Assessment Act*, Bill 59 (1990) received Third Reading in the House. This Act, which legislates the Mine Development Review Process, is expected to be Proclaimed in 1991.

1.3. BRANCH STRUCTURE

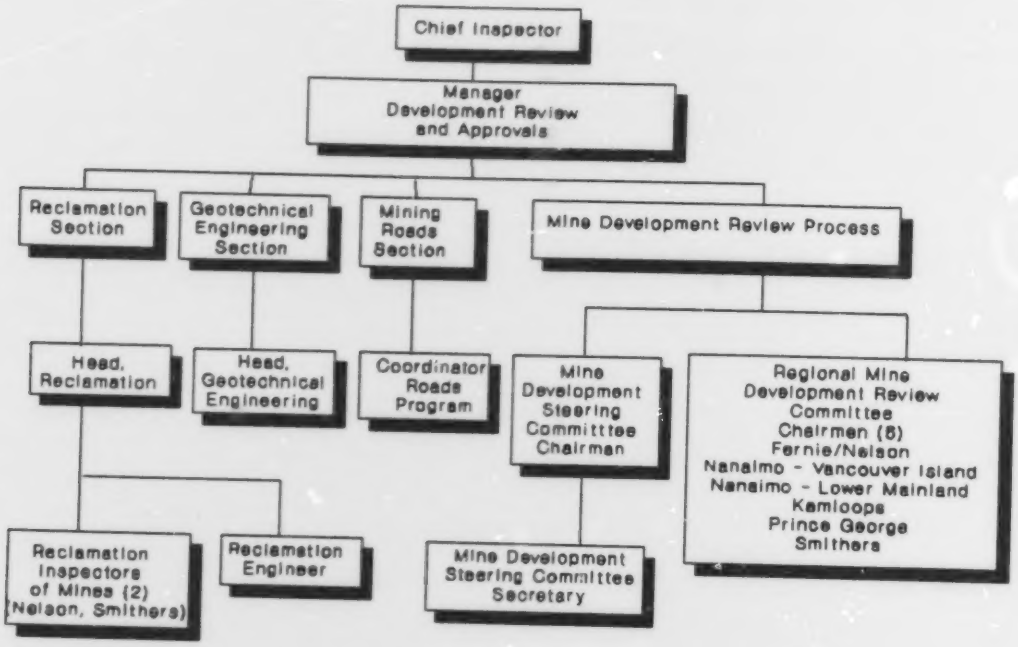
1.3.1. Overview of Branch Structure



1.3.2. Administration and Operating Systems

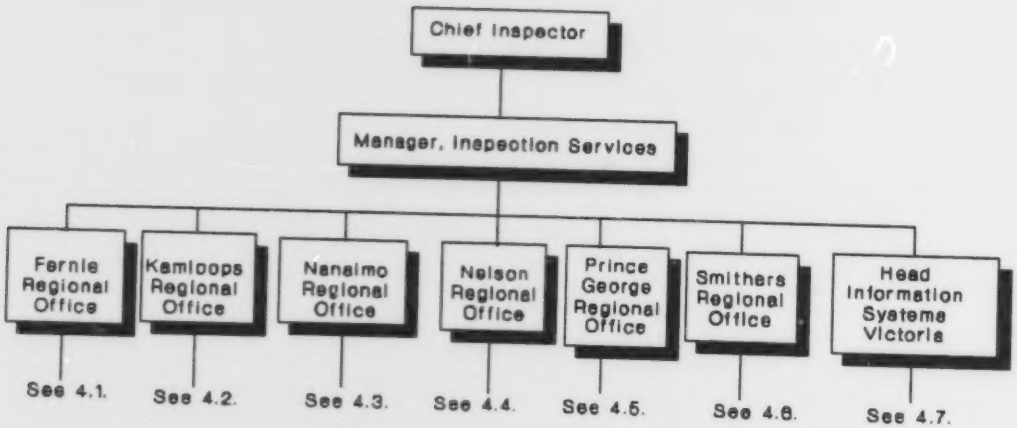


1.3.3. Development Review and Approvals

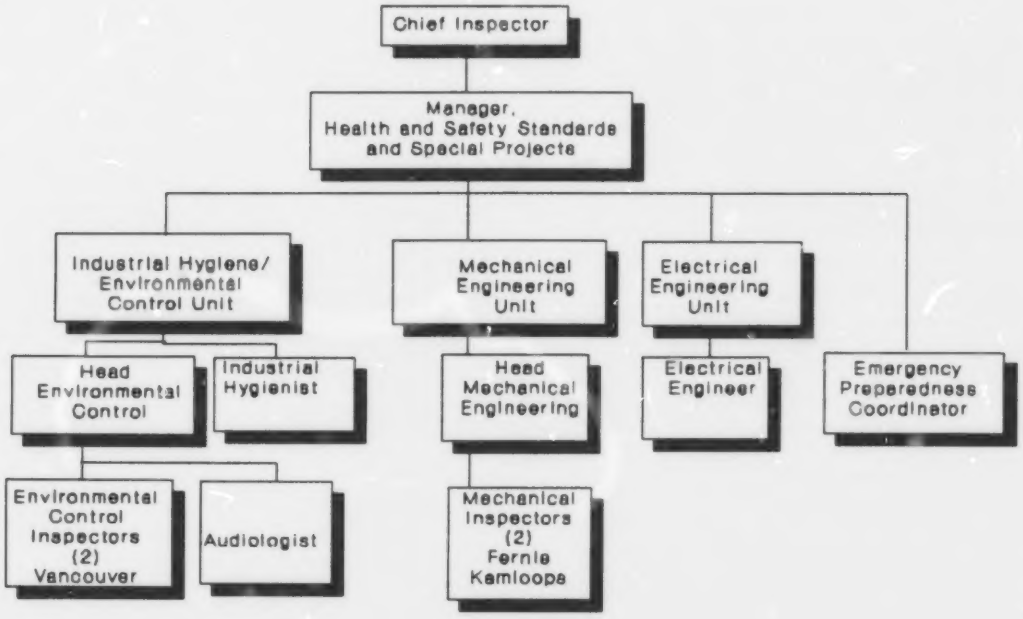


Positions based in Victoria except as indicated.

1.3.4. Inspection Services



1.3.5. Health and Safety Standards and Special Projects



Positions based in Victoria except as indicated.

1.4. 1990 OVERVIEW STATISTICS

1.4.1. Production and Employment at Major British Columbia Mines, 1990

Inspection District #	Mine/Owner or Operator	Tonnes Milled	Principal Minerals	Total Avg. Employed
1	Cassiar/Princeton Mining Corp.	892 375	Asbestos	344
	Golden Bear/Golden Bear Op.Co.	69 805	Gold,Silver	115
	*Johnny Mountain/Skyline Gold Corp.	87 189	Gold,Silver	56
	Premier/Westmin Resources Ltd.	735 598	Gold,Silver	166
2	Bell/Noranda Minerals Ltd.	5 422 911	Copper,Gold,Silver	303
	Equity/Equity Silver Mines Ltd.	3 145 900	Copper,Gold,Silver	205
	Lawyers/Cheni Gold Mines Ltd.	184 587	Gold,Silver	145
	Shasta/Int'l Shasta Res. Ltd.	63 867	Gold,Silver	28
3	*Blackdome/Blackdome Min.Corp.	72 912	Gold,Silver	102
	Highland Valley/Highland Valley Copper	46 263 361	Copper,Gold,Silver,Molybdenum	1 230
4	*Beaverdell/Teck Corp.	36 225	Lead,Zinc,Silver	34
	*Brenda/Brenda Mines Ltd.	4 281 870	Copper,Gold,Silver,Molybdenum	190
	Nickel Plate/Corona Corp.	1 141 255	Gold,Silver	173
5	Silvana/Treminco Resources Ltd.	31 574	Lead,Zinc,Silver	38
6	Sullivan/Cominco Ltd.	399 653	Lead,Zinc,Silver	379
7	No major metal mines.			
8	Island Copper/BHP-Utah Mines Ltd.	18 361 264	Copper,Gold,Silver,Molybdenum	549
	Myra Falls/Westmin Resources Ltd.	1 162 337	Copper,Zinc,Gold,Silver	608
9	No major metal mines.			
10	Gibraltar/Gibraltar Mines Ltd.	12 634 562	Copper,Gold,Silver,Molybdenum	301
11 & 12	No major metal mines.			
13	Endako/Placer Dome Inc.	9 772 865	Molybdenum	217
14	No major metal mines.			
15	Afton/Afton Mines Ltd.	2 655 430	Copper,Gold,Silver	208
	Similco/Princeton Mining Corp.	6 676 862	Copper,Gold,Silver	329
	Samatosum/Minnova Inc.	169 152	Lead,Zinc,Silver,Gold,Copper	92
TOTAL	**METAL AND ASBESTOS MINES**	**114 261 554**		**5 812**
8	Quinsam/Quinsam Coal Ltd.	258 366	Coal	74
9	Bullmoose/Teck Corp.	1 605 204	Coal	336
	Quintette/Denison Mines Ltd.	4 610 928	Coal	1 462
12	Balmer/Westar Mining Ltd.,	5 561 296	Coal	1 265
	Byron Creek/Esso Resources Ltd.,	1 491 446	Coal	323
	Fording/Fording Coal Ltd.,	6 603 973	Coal	1 007
	Greenhills/Westar Mining Ltd.,	2 996 184	Coal	631
	Line Creek/Crowsnest Res.Ltd.,	2 052 762	Coal	474
TOTAL	**COAL MINES**	**25 180 159**		**5 572**

* Mine closed.

1.4.2. Mine Inspection

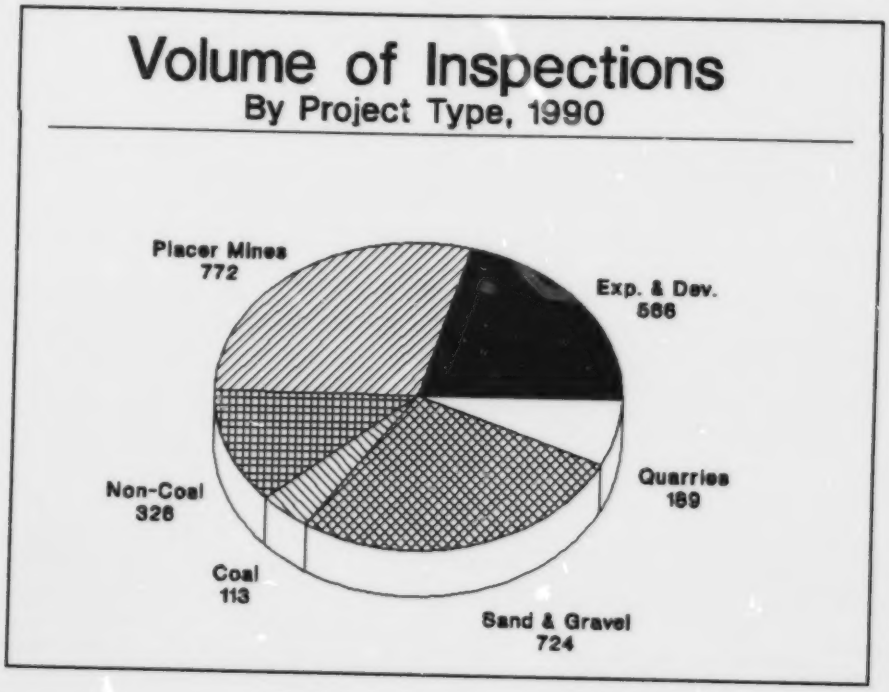
Type of Operation	Number of Inspections	% of Total
Non-Coal	326	12.1
Coal	113	4.2
Sand & Gravel	724	26.9
Quarries	189	7.0
Placer Mines	772	28.7
Exploration and Development	566	21.0
Total	2,690	100.0

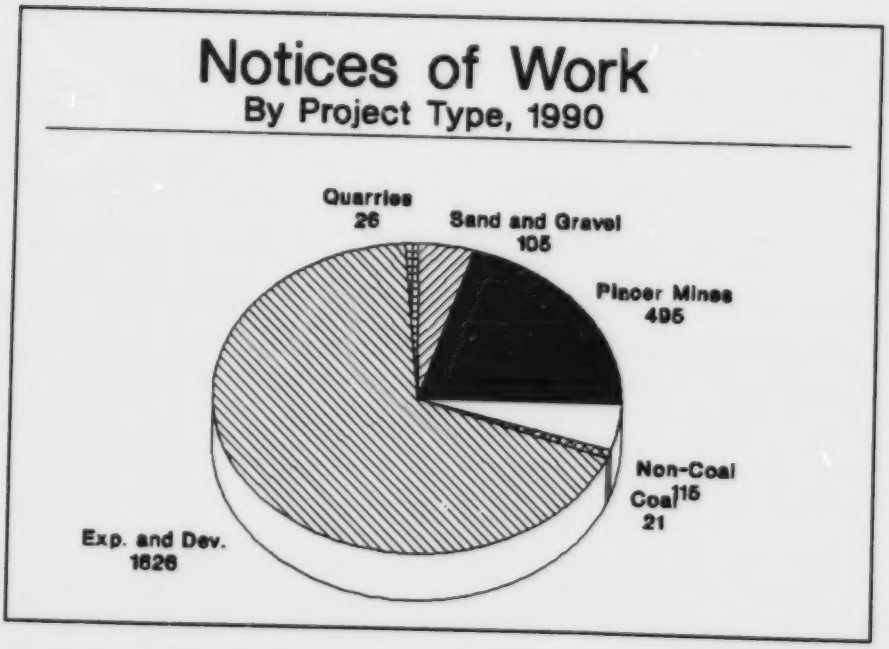
1.4.3. Mine Permitting

Type of Operation	Notices of Work/ Approvals of Mining Projects	% of Total
Non-Coal	115	4.8
Coal	21	0.9
Sand & Gravel	105	4.4
Quarries	26	1.1
Placer Mines	495	20.7
Exploration and Development	1,626	68.1
Total	2,388	100.0

1.4.4. Mine Development Review Process

Stage of M.D.R.P.	Number of Submissions Filed
Prospectus	7
Stage I	7
Stage II	1
Total	15


Volume of Inspections
By Project Type, 1990
Placer Mines
772
Exp. & Dev.
568
Quarries
189
Sand & Gravel
724
Coal
113
Non-Coal
326


Notices of Work
By Project Type, 1990
Quarries
26
Sand and Gravel
105
Placer Mines
495
Non-Coal
115
Coal
21
Exp. and Dev.
1626

PART 2: BRANCH ADMINISTRATION

The Branch administrative mandate is to ensure that the personnel and financial resources of the Branch are managed for maximum efficiency and effectiveness.

2.1. BRANCH STAFFING LEVELS

The following table shows the staffing levels of the Engineering and Inspection Branch from 1980–1990. The numbers show full–time employees only and do not include auxiliary personnel. The staffing level in 1990 remained at 58, the same level as 1989, and a decrease of 25% from a decade ago.

Branch Staffing Level, 1980–1990

Year	No. of Full–Time Employees
1980	77
1981	77
1982	66
1983	66
1984	61
1985	61
1986	60
1987	61
1988	52
1989	58.25
1990	58.25

2.2. BRANCH PERSONNEL

In 1990, the Chief Inspector of Mines and Director of the Branch was Mr. R.W. McGinn.

During the year, the Branch continued to carry out its mandate without a full complement of staff because of the difficulty in attracting qualified individuals to fill vacant positions. However, towards year–end the supply of appropriate applicants improved significantly and full staffing is expected to be achieved in 1991. In order to assist in the fulfilment of the mandate during 1990, some work was carried out under contract. Also, the Branch continued to make use of co–op students from various educational institutions. Their assistance in Victoria and the regional offices enables the completion of projects that otherwise could not be undertaken because of the demands on permanent staff by ongoing Branch programs.

Public interest and expectations for involvement in new mine proposals, combined with increased land use planning (parks, forests, watersheds) by other ministries and heightened public awareness and concern regarding mining activities, continues to require more staff attention and close liaison with federal and provincial government ministries and agencies.

The following Branch personnel are listed by office and position, with auxiliary positions indicated by the abbreviation (aux).

Victoria:	
Chief Inspector of Mines/Director	R.W. McGinn
Manager, Branch Administration	L. Rennie
Manager, Development Review and Approvals	R.L. Crook
Manager, Inspection Services	R.A. Fyles
Manager, Health and Safety Standards and Special Projects	T. Vaughan-Thomas
Head, Environmental Control Engineering	D.J. Murray
Head, Geotechnical Engineering	R.T. Martin
Head, Information Systems	B. McLaughlin
Head, Mechanical Engineering and Materials Handling	T.G. Carter
Head, Reclamation	J.C. Errington
Co-ordinator, Roads Program	J.E. Brenner
Emergency Preparedness Co-ordinator	R. Brow
Head, Electrical Engineering	R.F. King/D.M. Edwards
Inspector of Mines - Reclamation	D.M. Galbraith
Mine Development Steering Committee Chairman	N. Ringstad
Mine Development Steering Committee Secretary (Acting) (aux)	A. Currie/B. Paul
Records Supervisor	E. Seronik
Records Clerk	N. Selene (Morgan)
Secretary	V. Archer
Secretary	S. Ferguson
Secretary	B. Hill/P. Knudson (aux.)
Secretary	C. Howell
Office Assistant (aux)	L. Ostle
Office Assistant (aux)	G. Tucker
Office Assistant (aux)	M. Wiegler
Office Assistant/Receptionist (aux)	K. Sawrie

Vancouver:	
Inspector of Mines - Environmental Control	R. Kumar
Inspector of Mines - Environmental Control	A. Parker
Inspector of Mines - Environmental Control/ Audiologist	V. Pyplacz

Fernie:	
District Inspector and Resident Engineer/ Office Administrator	R. Booth
District Inspector and Resident Engineer	A. Whale
Inspector of Mines/Rescue Co-ordinator	P.J. Switzer
Inspector of Mines - Mechanical	G.A. MacDonald
Inspector of Mines (aux)	D. Roach
Secretary	L. McIntyre
Office Assistant (aux)	L. Northey/V. Smolik

Kamloops:	
District Inspector and Resident Engineer/ Office Administrator	F.J.T. Hancock
District Inspector and Resident Engineer	E. Sadar
District Inspector of Mines	J.E. Beswick
Inspector of Mines - Mechanical	R. Heistad
Inspector of Mines	H.P. Seguin
Secretary	L. MacCulloch
Office Assistant	J. Worsfold
Office Assistant (aux)	L. Wilms

Nanaimo:	
District Inspector and Resident Engineer/ Office Administrator	R. Bone
District Inspector and Resident Engineer	E. Beresford
Inspector of Mines	J.C. Alvarez
Inspector of Mines	H.A. Armour
Secretary	G. Peachey
Office Assistant (aux)	K. McKay/L. Quinn (aux)
Nelson:	
District Inspector of Mines/ Office Administrator	M.A. Mellor
Inspector of Mines - Reclamation	A.L. O'Bryan
Secretary (aux)	S. Beatty
Office Assistant (aux)	S. Smith
Prince George:	
District Inspector and Resident Engineer/ Office Administrator	D. Turner
District Inspector and Resident Engineer	S. Wuschke
District Inspector of Mines	J.J. Sutherland
Inspector of Mines	D. Miller
Secretary	T. Burroughs
Office Assistant	N. Wood
Smithers:	
District Inspector and Resident Engineer/ Office Administrator	D.W. Flynn
District Inspector and Resident Engineer	B. Good
Inspector of Mines	D. Porteous
Inspector of Mines - Reclamation	E.J. Hall
Secretary	E. Konschuh
Office Assistant	S. Ciampichini
Office Assistant	E. Burchett
Office assistant (aux)	G. Baker

2.3. STAFF CHANGES

The following staff changes occurred during 1990:

January:
- Steven Wuschke joined the Prince George office.
- Paulette Knudsen commenced employment in Victoria.
- Laurel Wilms assisted in the Kamloops office until March.

February-March:
- No changes.

April:
- Lynn Ostle resigned from the Victoria office staff.
- Terry Martin resigned from the Victoria staff.
- Ed Beswick was appointed as District Inspector in Kamloops.

May:
- Ron King resigned from the Victoria office.
- Eric Beresford was appointed District Inspector and Resident Engineer in Nanaimo.
- Dennis Roach rejoined the Fernie office staff.

June:
- Ray Crook transferred to the office of the Deputy Minister.
- Lenore Northey resigned from the Fernie office.
- Valerie Smolik joined the Fernie office staff.
- Sheri Beatty successfully competed for the position of secretary in Nelson.
- Gillian Tucker left the Victoria office.

July:
- No changes.

August:
- Bob Paul was seconded into the Victoria office to fill in for Anne Currie, who commenced maternity leave.

September:
- Laurel Wilms returned to the Branch to assist in Kamloops on a part-time basis.

October:
- Sueann Ciampichini resigned from the Smithers office.
- Kathy McKay commenced maternity leave and Lisa Quinn returned to the Nanaimo office to fill in during her absence.

November:
- Esther Burchett commenced part-time employment in the Smithers office.
- Dave Edwards replaced Ron King in the Victoria office as the Electrical Inspector of Mines.

December:
- Terry Vaughan-Thomas retired from the Victoria office after twelve years of service with the Branch.

2.4. BRANCH BUDGET

The Branch budget for 1980-1990 is given in actual dollars.

Year	Budget (Millions $)
1980	2.46
1981	2.68
1982	3.29
1983	2.76
1984	3.35
1985	3.38
1986	3.53
1987	3.46
1988	3.71
1989	3.93
1990	4.58

PART 3. DEVELOPMENT REVIEW AND APPROVALS

3.1 RECLAMATION

Roles and Responsibilities

Concern for the environment during and after mine development is an important issue in British Columbia. Therefore, since 1969 mining companies have been required by law to reclaim all lands disturbed by mining. Law requires that reclamation permits be applied for and held by all mining companies and that security deposits be held by the Province for each reclamation permit. Security deposits ensure that reclamation programs are adequately completed.

The duties of the Reclamation Section include:

- o review and issue of mine reclamation permits;
- o inspection of reclamation at mines;
- o administration of reclamation security deposits on behalf of the provincial government; and
- o participation in selected committees and activities to enhance mine reclamation in the province, including the Technical and Research Committee on Reclamation, and the British Columbia Acid Mine Drainage Task Force

Structure and Organization

The Reclamation Section is comprised of four personnel: the Manager and Reclamation Engineer, based in Victoria; and two Reclamation Inspectors, one based in Nelson and one in Smithers.

The Section works closely with industry, academia, and other members of government. Cooperation among these groups through both the Technical and Research Committee on Reclamation and the British Columbia Acid Mine Drainage Task Force allows for information exchange among the members and rapid dissemination of new technology throughout the mining industry. Support given to reclamation research projects ensures that B.C. continues to address the environmental concerns associated with mineral development.

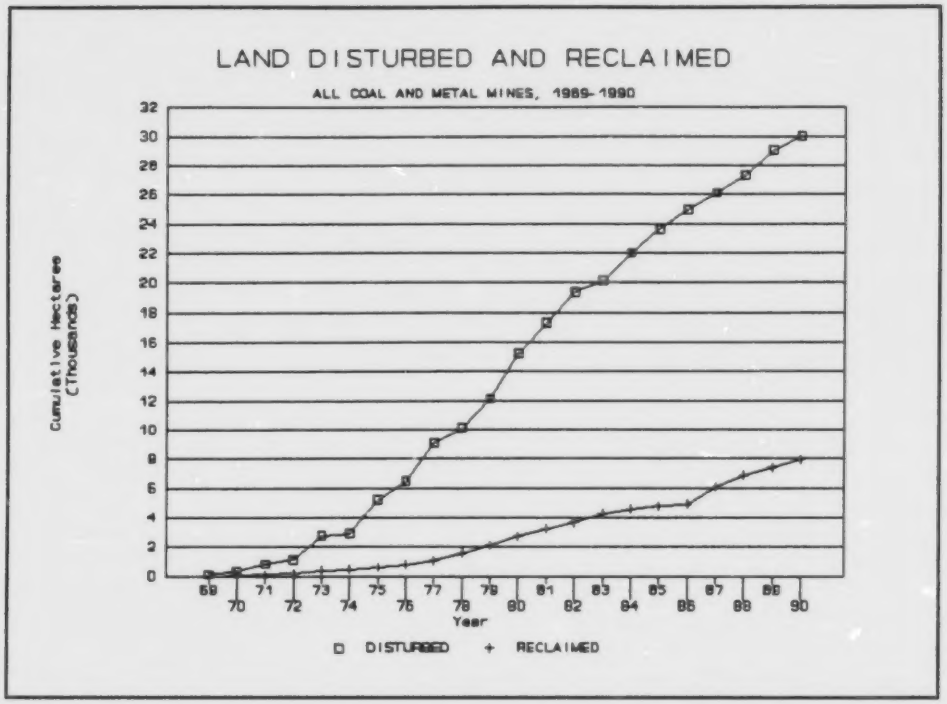
Summary of Activities

Since the late 1960s, the composition of the mining industry in B.C. has changed from being almost exclusively underground operations, to mainly large-scale open pits. The coal and copper sectors have expanded greatly, and recently gold mining has again become important.

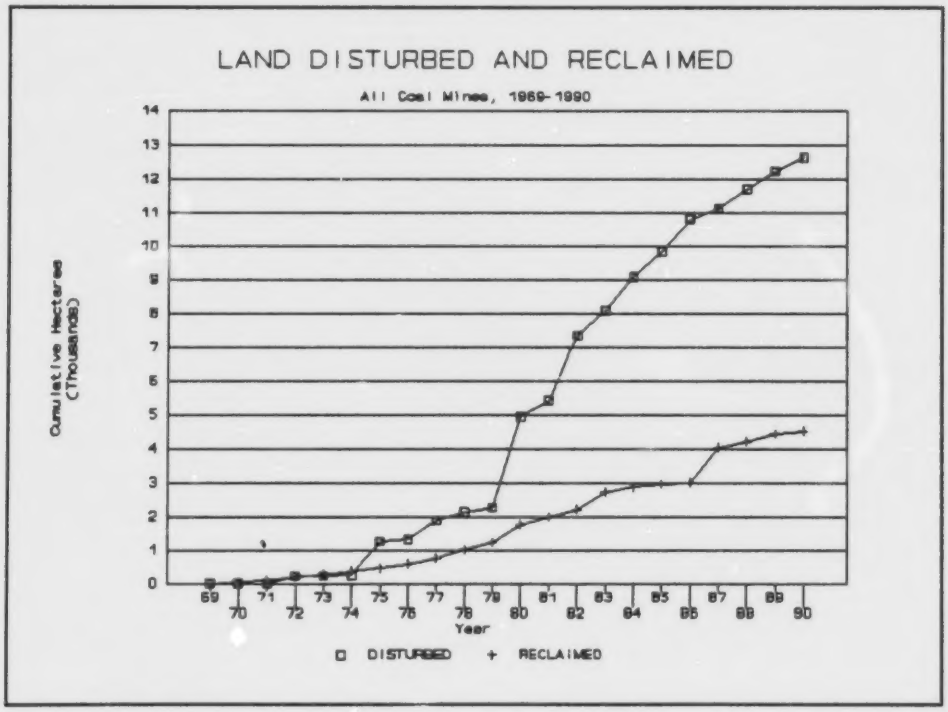
The mining industry now utilizes a much greater land base. Major coal and metal mines, which occupied less than 1,000 hectares in the late 1960's, now cover 30,019 hectares. A total of 7,926 (26%) has been reclaimed by revegetation activities, as depicted in the following table and graph:

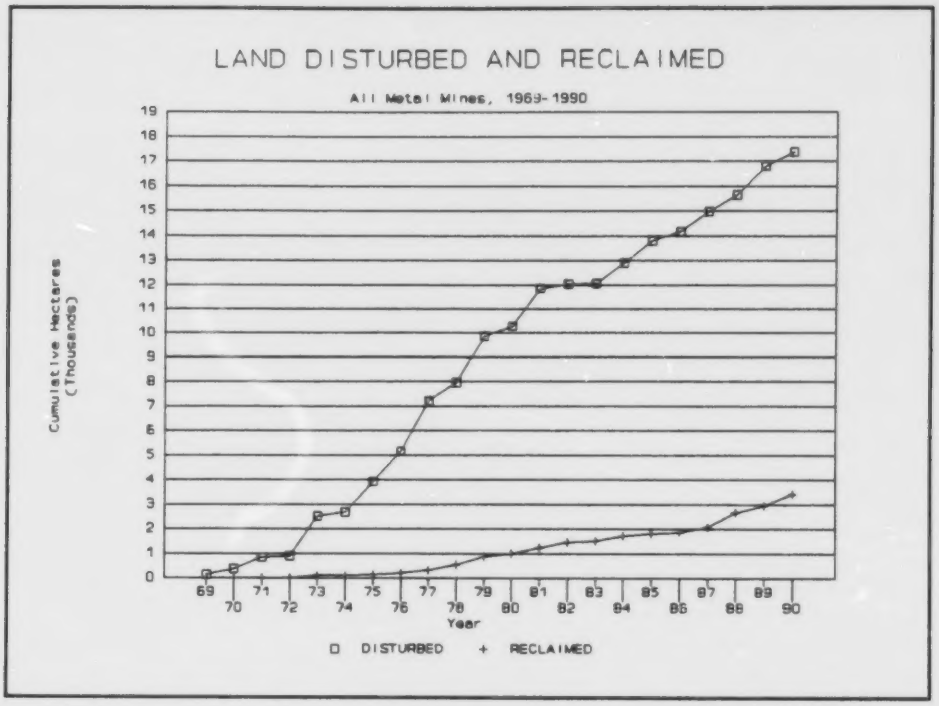
Mining Land Disturbance and Reclamation as of 1990
(Cumulative Hectares)

Type of Mine	Area Disturbed	Area Reclaimed
Coal Mine	12,641	4,519
Metal Mine	17,378	3,407
Total	30,019	7,926



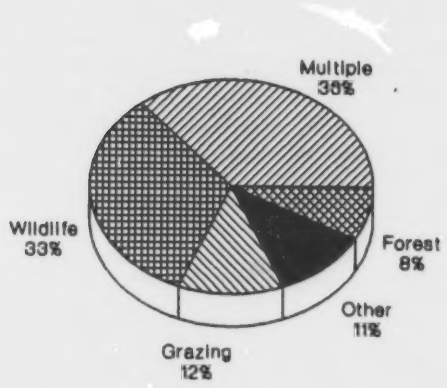
The following graphs show the separate breakdown of disturbed and reclaimed land at coal and metal mines. Coal mines have disturbed 12,641 hectares, almost 36 per cent of which (4,519 ha) has been reclaimed. Metal mines have disturbed 17,378 hectares, of which 3,407 hectares (19%) have been reclaimed.





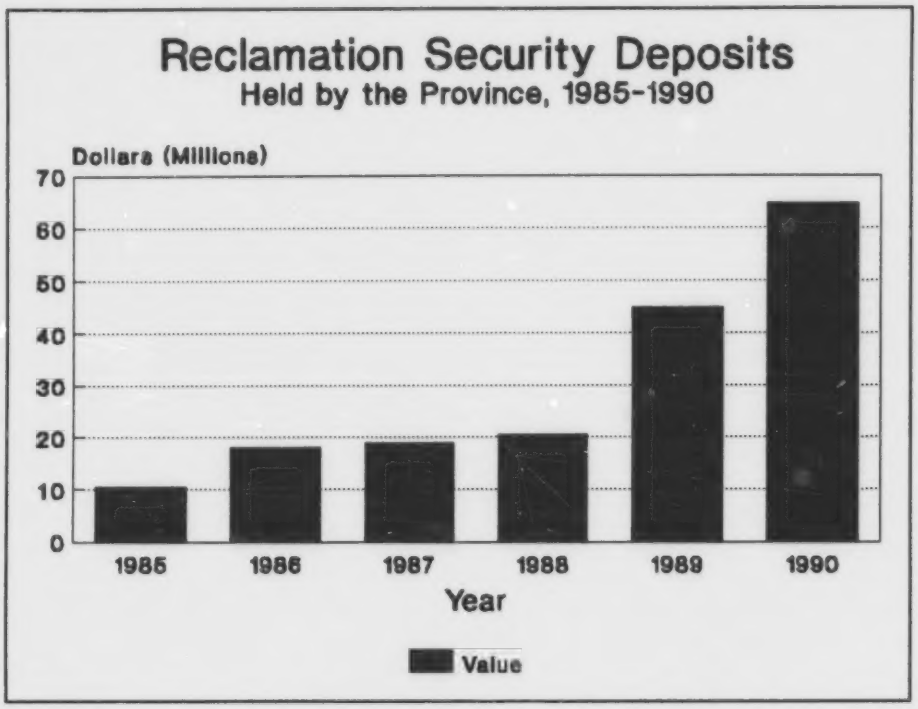
Over 50% of proposed reclaimed land use objectives are aimed at providing wildlife habitat, grazing, and forestry opportunities, as depicted in the following chart:

Land Use Objectives for all Mines



Reclamation Securities and Funds

More importance has been placed on reclamation security deposits in recent years. Recent changes to the *Mines Act* and adjustments in particular bonds to more closely match actual costs of reclamation has led to a substantial increase in the security held by the Province. In 1985, a little over $10 million was held in security; at the end of the 1990 fiscal year, reclamation deposits totalled $64,616,695.



The *Mines Act* also provides for the establishment of mine specific reclamation funds to provide income for long-term treatment of acid mine drainage. The details of these funds are currently being discussed with industry and the federal government.

Technical and Research Committee on Reclamation

This committee has been active in promoting and fostering reclamation research for over sixteen years. Members are drawn from the Ministry of Energy, Mines and Petroleum Resources, the Ministry of Environment, Environment Canada, mining companies, The Mining Association of British Columbia, and the Coal Association of Canada. This committee has been responsible for the organization of the annual B.C. Mine Reclamation Symposium for the past fourteen years.

Mine Reclamation Symposium

The fourteenth annual Mine Reclamation Symposium was held June 19-21, 1990 in Cranbrook, British Columbia. During the symposium awards and citations were presented honouring outstanding achievements in mine reclamation. The Annual B.C. Mine Reclamation Award was presented to Westar Mining for work at its Balmer Operation. Citations were also presented to Total Energold Corporation for Metal Mine Reclamation at the Erickson Gold Mine; to Quintette Coal Limited for Coal Mine Reclamation; to Quintette Coal for Exploration Reclamation at the Transfer, Grizzly, Mesa and Wolverine exploration areas; and to Queenstake Resources for Placer Mine Reclamation at their Moyie River Placer mine.

Reclamation Section Initiatives

The Ministry believes that improved public access to information, greater public involvement in decision making processes and improved regulations will achieve the success of environmental protection programs in the Province. A number of initiatives have been undertaken by the Ministry.

1. Improved Public Access to Information:

   - Quarterly publication of the Mineral Market Update (MMU) which contains information on all Ministry programs, status reports on projects in the Mine Development Review Process, and summary statistics on exploration and reclamation permits issued.

   - Development of a Ministry computerized database, which contains information on all reclamation permits, allows Ministry personnel to respond more effectively to public requests for information.

2. Public Involvement:

   - The *Mines Act* has incorporated a specific provision for companies to file a notice in the B.C. Gazette and local newspapers when mineral exploration is to be conducted in sensitive areas. These notices will solicit recommendations from interested parties.

3. Improved Regulations:

   - A number of improvements are underway that will streamline the reclamation permitting process.

   - Policy on acid mine drainage has been formalized.

   - Review of reclamation securities is continuing to ensure that they reflect the estimated cost of reclamation.

3.2. ACID MINE DRAINAGE INITIATIVES IN BRITISH COLUMBIA

Acid mine drainage is the largest single environmental problem facing the Canadian mining industry today and British Columbia is no exception. The province contains about 72,000,000 tonnes of acid generating tailings, or about 4% of the total in Canada. However, there are about 300,000,000 tonnes of acid generating waste rock or 80% of the Canadian total, which is increasing by about 25,000,000 tonnes per year. As such, British Columbia contains a disproportionate amount of acid generating waste rock and, therefore, the mining industry and regulatory agencies have a great interest in abating acidic drainage from that waste type.

Technologies to prevent acidic drainage from occurring in waste rock piles and tailings sites, and on the walls of open pits and underground mines, need to be developed and demonstrated. There are two groups in Canada which have accepted this challenge: the national Mine Environment Neutral Drainage (MEND) program and the British Columbia Acid Mine Drainage (BC AMD) Task Force.

The MEND program was initiated in 1986 in response to the need to conduct research on acid mine drainage. The MEND program consists of a steering committee and technical working group, with representation from the mining industry, CANMET (Energy, Mines and Resources, Canada), Environment Canada, British Columbia, Manitoba, Ontario, Quebec and New Brunswick. In British Columbia, the BC AMD Task Force is coordinating research into the problem. The Task Force was established in March 1987 by the Mining Association of BC, mining companies, and the federal and provincial governments. The B.C. AMD Task Force is chaired by the Chief Inspector and guides the Province's selection of AMD research projects. Both programs are coordinated to ensure that there is no duplication of effort.

In British Columbia, considerable attention is focused on the prediction and prevention of acid mine drainage before a new mine proposal is approved under the Mine Development Review Process. The review process which has recently been legislated under the Mine Development Assessment Act, is a comprehensive review and approval system for new mine projects in the province. All proposed mines are expected to conduct thorough studies to demonstrate that acid mine drainage problems can be managed by technically sound and economically affordable means prior to mine construction. Laboratory techniques to predict acidic drainage were developed in British Columbia in the early 1970's and have been used extensively and further refined since that time. Considerable uncertainty remains, however, about the accuracy of prediction techniques and the effectiveness of proposed prevention plans.

In 1990, along with the publication of its 1989/1990 annual report, the BC AMD Task Force published six reports from projects conducted in 1989. The reports have been distributed widely to mining companies, consultants, regulatory agencies, universities, newspapers, and public interest groups. Copies of the 1989/1990 Annual Report, British Columbia Acid Mine Drainage Task Force are available from the Engineering and Inspection Branch (Rm. 105 - 525 Superior Street, Victoria, B.C. V8V 1X4). Copies of the other reports are available from BiTech Publishers Ltd. (#903 - 580 Hornby Street, Vancouver, B.C. V6C 3B6).

Reports currently available from BiTech include the following:

- Acid Drainage From Mine Walls: The Main Zone Pit At Equity Silver Mines, by Morwijk Enterprises Limited;
- Geochemical Assessment Of Subaqueous Tailings Disposal In Buttle Lake, British Columbia, by Rescan Environmental Services Limited;
- Kutcho Creek Project, Acid Generation Testwork, Phase II, by Rescan Environmental Services Limited;

- Hydrogeological Assessment And Development of AMD Control Technology For Myra Falls Waste Rock, by Northwest Geochem;
- Literature Review For Biological Monitoring Of Heavy Metals In Aquatic Environments, by E.V.S. Consultants Limited; and,
- The Effect Of Treated Acid Mine Drainage On Stream Macroinvertebrates And Periphytic Algae: An In Situ Mesocosm Experiment, by Limnotek Research and Development Inc..

The Task Force budgeted for approximately one million dollars in 1990. Mineral Development Agreement funding amounted to almost $155,000, Sustainable Environment Fund funding totalled $95,000, and Industry funded the remainder.

In 1990, the Task Force continued to support seven ongoing projects and coordinated the start up of four new projects. The eleven projects included the following:

2.30 Underwater Disposal of Waste Rock and Tailings, by Rescan Environmental Consultants Ltd.;

2.60 Blending and Segregation (Kutcho Creek Project), by Rescan Environmental Consultants Ltd.;

3.30 Mount Washington Evaluation, by MEMPR;

3.40 Dry Covers on Waste Rock: Westmin, by NorthWest GeoChem;

3.52 Constructed Wetland: Bell Mine, by Gormely Process Engineering;

4.30 Aquatic Invertebrates Monitoring, by Limnotek Research and Development Inc.;

4.40 Sediment Monitoring Techniques, by E.V.S. Consultants Ltd.;

1.30 Cinola Gold Project Kinetic Tests (Rock Pads), by Norecol Environmental Consultants;

1.40 Compile AMD Prediction Data, Morwijk Enterprises Ltd.;

3.31 Britannia (AMD) Toxic Leachate, by Steffen Robertson and Kirsten; and,

4.50 Ion Speciation Model, by CB Research International.

The BC AMD Task Force has promoted the establishment of a research Chair at the University of British Columbia (UBC) in Mining and the Environment. This Chair has now been funded for a five year period by a grant from the Government of British Columbia to facilitate and focus research work on Acid Mine Drainage. A selection panel has been struck by Dean Axel Meisen and includes representatives of the BC AMD Task Force. In addition, the Ministers of Energy, Mines and Petroleum Resources and Environment, jointly with Dean Axel Meisen of UBC , have appointed an advisory board that includes membership from the BC AMD Task Force, industry and the environmental consulting firms to assist and guide the professor assuming the Chair.

Both government and industry recognize the large financial implications of long-term treatment of acid mine drainage. Recent changes to the *Mines Act* have provided for the establishment of a Mine Reclamation Fund which can be established during mine operations to finance the long-term treatment costs associated with acid mine drainage.

3.3. GEOTECHNICAL

Role and Responsibilities
The duties of the Geotechnical Section include:
-The inspection of major geotechnical works at mines.
-The assessment of engineering designs.
-The regulation of operational projects in the geotechnical field.

The structures being monitored include tailings impoundments, waste rock dumps, spoil piles or stockpiles, and pitwalls. Other projects of occasional concern are water-retaining works and treatment ponds containing hazardous wastes.

Structure and Organization
The Section is administered by the Manager, Development Review and Approvals, and is staffed by one senior engineer assisted by consultants, as required. In April, 1990 the senior geotechnical engineer resigned and the Branch was unable to find a replacement. A consultant provided geotechnical inspection and review services for the Branch during the remainder of the year. As a result, however, a summary of geotechnical activities is not available for 1990. This reporting will be re-established in 1991 with the hiring of a permanent staff member.

British Columbia Mine Waste Dump Research Committee
British Columbia mine dumps are the largest man-made structures on the face of the earth. Some of these are major mid-valley fills acting as rock drains. During 1990, the Chief Inspector of Mines organized a special committee to look at ways to protect the environment through special attention to waste dumps and rock drains at mining operations. The British Columbia Mine Waste Dump Research Committee is comprised of representatives of MEMPR Engineering and Inspection Branch, Ministry of Environment Waste Management Branch, Energy, Mines and Resources Canada - CANMET, industry, the academic world, and the Mining Association of British Columbia.

The Committee's prime responsibility is to co-ordinate and foster research into design parameters, site investigation, monitoring techniques, operating techniques, failure runout analysis, impact barrier design, maximum flood level calculations, and other topics pertinent to waste dumps and rock drains.

The Committee is also responsible for the transfer of knowledge and information obtained to mining companies, consultants and regulatory agencies to provide confidence that the province's mineral resources are developed in an environmentally sound manner.

Projects initiated during 1990 were as follows:

-Mine Dump Design Guidelines.
-Mine Dump Operational Guidelines.
-Monitoring Mine Dumps in Mountainous Terrain.
-Runout Characteristics of Dump Failures - Phase I.
-Database of Dump Failures in British Columbia.

3.4. MINING ROADS

Role and Responsibilities

Under the authority of the *Ministry of Energy, Mines and Petroleum Resources Act*, this Section operates the Mining and Petroleum Road Program to encourage and assist in the development of mineral resources in the province. The Road Program Section is staffed by one Certified Engineering Technician (Civil). In 1990, the Chief Inspector of Mines was responsible for administration of the section.

During the year, the Ministry of Energy, Mines and Petroleum Resources, Engineering and Inspection Branch continued to provide technical and shared-cost assistance for road access studies for potential new mining sites.

In 1990, the Section participated in providing review comments, technical advice, terms of reference and field inspections of completed mine access roads. Assistance was also provided to head office staff in Victoria and regional staff for review and recommendations for contracting of road access studies, and standards for haul roads on mine properties.

In addition to the above programs, the Section participated in the following projects:

1. The section was very active in answering queries and supplying information to other ministries and the general public regarding old mining roads. Some study and research was initiated on mining road liability and responsibility which is still of concern to ministries dealing with access throughout the province. Staff also attended meetings and discussions on local resource road use plans.

2. The Omineca Mine Road extension from Moose Valley to the Lawyers property, a distance of 104 km, was re-inspected to determine the degree of success of reclamation. Some locations showed vegetation has improved, while other areas appear to be establishing natural species. A landslide which occurred in 1989 along the road north of the Sturdee airstrip has not caused further access problems for the Cheni Gold Mine operation.

3. During the summer of 1990, the Ministry of Forests requested assistance from the Section to assist with input for the preparation of a maintenance special use permit and abandonment plan for the Golden Bear Operating Company mine road access. Completion of these documents is expected in 1991.

4. Discussion was initiated on the Mount Klappan road access, although this project was not active during 1990.

5. The MDRP Stage I report for the proposed **Windy Craggy** Access road was reviewed, and road access standards were discussed at meetings with the proponents.

6. The terms of reference for the **Iskut Road** access study were distributed to several consultants who were asked to submit proposals and cost estimates for the survey and design of approximately 100 km of mine road access into Eskay and Bronson Creeks. Proposals were reviewed and a contract awarded to Klohn Leonoff Ltd. Fieldwork started immediately in August, 1990, and was completed by November. Road section staff attended meetings and conducted liaison with the consultant, mining companies and other government agencies, in order to administer the project and keep all interested parties informed.

7. In 1986, the Road Section was assigned the task of producing a **Regional Placer Co-ordinating Committee Procedures Manual** for the Regional Mine Development Review Committees to use as a guide for addressing placer issues. In 1990, revision began on the draft manual in order to reflect changes in legislation and policies which have occurred in the intervening period.

3.5. MINE DEVELOPMENT REVIEW PROCESS

Role and Responsibilities

The Mine Development Review Process (MDRP) is a non-legislative review procedure for new mining ventures, which is sponsored and administered by the Province of British Columbia and driven by the working policy of the Cabinet Committee on Sustainable Development. The process is applied to coal and hardrock mineral mines, and includes new mines, major expansions, and large pilot projects. It does not apply to bulk samples less than 10,000 tonnes, placer, and sand and gravel operations.

The goal of the MDRP is to integrate environmental management with economic development by facilitating and expediting technically sound and environmentally acceptable mining ventures.

Administration of MDRP

The lead agency for the MDRP, the Ministry of Energy, Mines and Petroleum Resources, chairs the Mine Development Steering Committee (MDSC) and all Regional Mine Development Review Committees (RMDRCs), and provides both administrative and technical support to these committees.

The MDSC is responsible for coordinating the review of mine developments. Committee members include senior staff from: the Ministry of Energy, Mines and Petroleum Resources; B.C. Environment; the Ministry of Transportation and Highways; the Development Services Branch of the Ministry of Municipal Affairs, Recreation and Culture; the Archaeology Branch of the Ministry of Municipal Affairs, Recreation and Culture; the Ministry of Native Affairs; the Ministry of Economic and Regional Development; and Environment Canada.

The MDSC may delegate reviews of small and relatively simple projects to one of six RMDRCs for local handling by regional permitting staff. These committees are based in:

- Smithers (Northwest Mine Development Review Committee);
- Prince George (Northeast Mine Development Review Committee);
- Kamloops (Southcentral Mine Development Review Committee);
- Fernie/Nelson (Kootenay Mine Development Review Committee);
- Nanaimo (Vancouver Island Mine Development Review Committee);
- Vancouver (Lower Mainland Mine Development Review Committee).

Committee members include technical staff from: the Ministry of Energy Mines and Petroleum Resources; B.C. Environment; the Ministry of Forests; the Ministry of Crown Lands; Environment Canada; and Fisheries and Oceans Canada.

Summary of 1990 Activities

During 1990, 34 projects entered the MDRP. Three projects received approval-in-principle (AIP) and advanced to Stage III, the licensing stage, as follows:

- Snip Gold project was granted AIP in January, 1990;
- Quesnel River Gold project was granted AIP in July, 1990; and
- Silbak Premier Gold - Province Zone was granted approval in August, 1990.

As indicated in the table below, the MDSC reviewed 15 project submissions in 1990 compared to 34 in 1989. Significant projects in the process included:

- the Windy Craggy Copper/Gold/Cobalt Project, located in the northwestern corner of B.C.;
- the Mount Polley Copper/Gold Project, which is expected to receive approval-in-principle in 1991;
- the Mount Milligan Copper/Gold Project, situated in northeastern B.C.; and
- the Telkwa Coal Project near Telkwa, B.C.

Project reviews handled by the RMDRCs in 1990 included the Quesnel River Gold Project and Fordings' Henretta Dragline Proposal.

Mine Development Assessment Act

In July 1990, the Province of British Columbia introduced the *Mine Development Assessment Act* which formalizes the MDRP. This legislation was considered necessary to:

- demonstrate the province's commitment to thorough environmental assessments for all significant mine developments in British Columbia; and
- establish a legal basis for public participation in the review process by upgrading the provisions for public consultation.

The Ministry plans to proclaim the Act in the Spring of 1991.

Summary of submissions filed in 1990

DATE FILED	LEVEL OF SUBMISSION	PROJECT/ SUBMISSION CODE	PROJECT NAME	COMPANY NAME
February	Prospectus	144-1	Mount Milligan Copper/Gold	Continental Gold Corp.
February	Prospectus	145-1R	Henretta Coal	Fording Coal
March	Stage II	141-2	Telkwa Coal Extension	Crows Nest Res. Ltd.
March	Prospectus	146-1	Sukunka Coal Reapplication	Canadian Coal Co. Inc.
April	Prospectus	147-1	Eskay Creek Gold	Calpine Resources Inc.
April	Stage I (Addendum)	120-3R	Quesnel River Gold	QPX Minerals Inc.
June	Stage I (Env.Summ)	106-5	Snip Operations	Cominco Metals Corp.
October	Stage I	132-2	Mount Polley Copper/Gold	Imperial Metals Corp.
October	Prospectus	148-1R	Harmer West Extension Coal	Westar Mining Ltd.
November	Stage I (Addendum)	114-3	Windy Craggy Copper/Gold	Geddes Resources Ltd.
November	Prospectus	49-1R	Vine Gold	Kokanee Resources Ltd.
November	Stage I	150-1R	Byron Creek-South Extn.	Byron Creek Collieries Ltd.
December	Stage I	145-2R	Henretta Coal	Fording Coal Ltd.
December	Prospectus	151-1R	SB Zone	Westmin/Tenajon Resources Ltd.
December	Stage I	152-1R	South Pit Expansion	Domtar Gypsum Ltd.

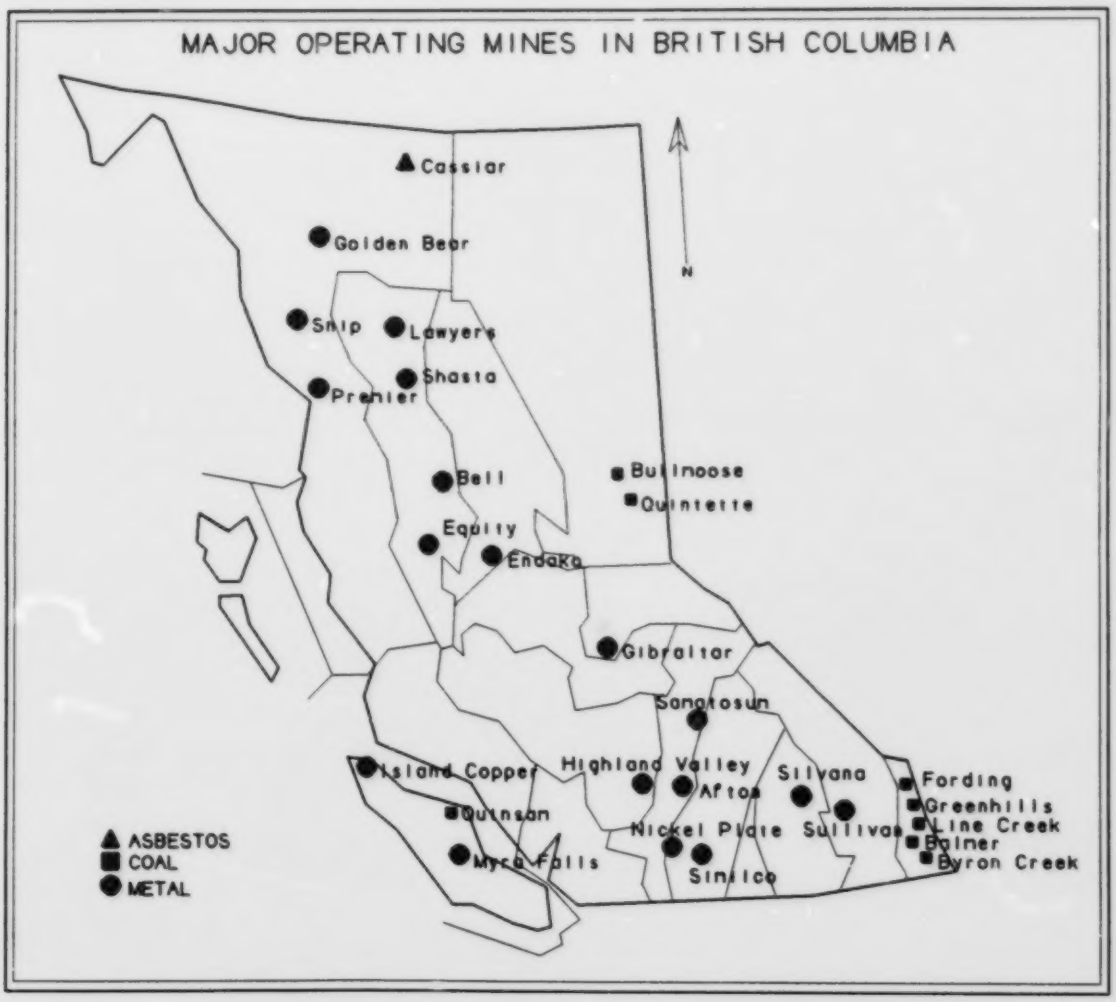
R - Projects handled by Regional Mine Development Review Committee

PART 4: INSPECTION SERVICES

Mining Inspectors monitor mining activity for adherence to mining legislation and operating permits. Contract Inspectors may also be used for inspecting small, low-impact projects.

Mines are inspected and monitored during all phases of activity from exploration through development, construction, operation, closure and abandonment. Map 2 shows the major operating mines in British Columbia in 1990, and their location within the mining inspection districts.

MAP 2.



4.1. FERNIE REGIONAL OFFICE

4.1.1. Office Address(es)

Main Office:
Bag 1000, Fernie, B.C., V0B 1M0.
Tel: (604) 423-6884 Fax: (604) 423-3194

Satellite Office:
100 Cranbrook Street North, Cranbrook, B.C., V1C 3P9
Tel: (604) 426-1557 Fax: (604) 426-1253

4.1.2. Office Personnel

During the year, office personnel included:

R. Booth	District Inspector and Resident Engineer/Office Administrator
A. Whale	District Inspector and Resident Engineer
P.J. Switzer	Inspector of Mines/Rescue Co-ordinator
G. MacDonald	Inspector of Mines - Mechanical
D. Roach	Inspector of Mines (auxiliary)
L. McIntyre	Secretary
L. Northey/V. Smolik	Office Assistant

4.1.3. Area of Responsibility

The Kootenay Region is currently administered by two separate offices, one in Fernie and one in Nelson. The Fernie Regional Office is responsible for Inspection Districts #6 and #12 (see Map 1) in the southeast corner of the province. A. Whale is responsible for District #6 and R. Booth is responsible for District #12. A satellite office in Cranbrook services the client group for mineral and placer properties in the western portion of the region.

4.1.4. Inspection District #6

OPERATING METAL OR COAL MINES:

MOYIE RIVER MINE

Lat. 49°25' Long. 115°57' (82F/08E)

Although the Moyie River operation is not a major mine in terms of volume of production, it is the most significant gold producer in the Kootenays. For this reason, a description of the operation is included in this year's annual report.

The Moyie River placer gold operation is located approximately 25 km south of Cranbrook via Highway 3 and 95 south, then via Moyie River logging road to Semlin Creek logging road.

The mine is owned and managed by Queenstake Resources Ltd., 10th Floor, 900 West Hastings Street, Vancouver, B.C. V6C 1E5.

Queenstake has been mining in the Moyie area since 1987. During this time, the workings have extended approximately 3 km along the valley, and two river diversions have permitted the location of pits to fully recover the placer gold from the preglacial river channels.

Approximately one million cubic yards are moved annually, of which approximately 15% is pay dirt which provide more than 3,000 ounces of gold. Reclamation is ongoing with this project.

SULLIVAN

Lat.49°45' Long.116°00' (82F/9E; 82G/12W)

The Sullivan underground zinc, lead, silver mine and concentrator are located within the city limits of Kimberley, B.C. The mine is on Mark Creek, 3.2 km north of the city centre, and the concentrator is 3.2 km south of the city centre.

The operation is owned by Cominco Ltd., 200 Granville Street, Vancouver, B.C., V6C 2R2.

This deposit is a hydrothermal synsedimentary occurrence in the Aldridge Formation. The orebody is a large, lens-like body lying on the east limb of a north-plunging anticline and measuring from a few feet to 300' in thickness. The base is massive pyrrhotite which is overlain by conformable layers of generally well-laminated sulphides separated by clastic (silty) rocks. The western part of the deposit is more massive than the eastern part as the sulphide layers become thinner to the east. The main sulphides are pyrrhotite, sphalerite, galena and pyrite. Chalcopyrite and arsenopyrite are minor constituents as well as some boulangerite, magnetite and cassiterite. In general, metal distribution is zoned, with higher lead content at the core and zinc in the east.

This lead, zinc, silver mine commenced production in 1923. The operation has both underground and open-pit mining; however, the open pit has been inactive since 1983. Ore production is mainly from pillar recovery operations, with ore extraction from slusher sublevels or mechanized drawpoints.

The Sullivan mine closed temporarily on January 1, 1990. The main reason for the shutdown stemmed from a labour dispute. However, Cominco also cited high fixed costs and low zinc prices as contributing factors. The mine returned to full production in November, 1990, with an estimated life expectancy of about ten years. Under a revised production schedule, 1.9 million tonnes of ore will be produced in 1991, and two million tonnes annually from 1992 to 1994. Cominco expects the mine to operate at current staffing levels of about 675 until 1998, when production will begin to drop.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, Vol.1, 1975-1980, pp.5-6.
_____. Mining in British Columbia, 1981-1985, p.5.
_____. Mining in British Columbia, 1986-1987 p.48-49.
_____. Mineral Market Updates, Vol.2 Nos.1-4, 1990.
MI 82F/NE-52.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

NAME: Lussier River
TYPE: Open Pit
PRODUCT(S): Gypsum
LOCATION: 50°02'N 115°31'W
OWNER(S): Domtar Construction Materials Inc.

NAME: Nicholson
TYPE: Open Pit
PRODUCT(S): Silica
LOCATION: 51°11'N 116°52'W
OWNER(S): Bert Miller Trucking & Contracting

NAME: Mount Moberley
TYPE: Open Pit
PRODUCT(S): Silica
LOCATION: 51°22'N 116°58'W
OWNER(S): Mountain Minerals Co. Ltd.

NAME: Mount Brussilof Mine
TYPE: Open Pit
PRODUCT(S): Magnesite
LOCATION: 50°47'N 115°41'W
OWNER(S): Baymag Mines Co. Ltd.

NAME: Windermere Operations
TYPE: Open Pit
PRODUCT(S): Gypsum
LOCATION: 50°29'N 115°52'W
OWNER(S): Westroc Industries Ltd.

NON-OPERATING MINES/MINE CLOSURES:
There were no permanent mine closures during the year.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:
Bar (49°28'N, 115°55'W): A large surface drilling and trenching program was carried out by Gold-Pac Investments Ltd.

Cash (49°44'N, 115°59'W): Kokanee Exploration Ltd. undertook a surface diamon drilling and trenching program.

David (49°17'N, 116°02'W): Bapty Research Ltd. conducted an extensive surface diamond drilling and trenching exploration program.

Elkhorn (50°17'N, 115°45'W): A surface diamond drilling program on this barite property was undertaken by Dynamic Drilling Fluids Ltd.

Eng (49°06'N, 116°05'W): An extensive road construction and drill program was carried out by Kokanee Exploration Ltd.

Estella (49°46'N, 115°36'W): Cominco Ltd. conducted a surface exploration program consisting of three diamond drill holes on this property.

Four J, Two T, (50°02'N, 115°30'W): An extensive percussion drill program was conducted on this gypsum property by Domtar Ltd.

Jake/Snake (49°15'N, 115°45'W): A surface drilling and trenching program was carried out by Bapty Research Ltd.

Kidd, Star (49°12'N, 116°15'W): A diamond drill program was conducted by Kokanee Exploration Ltd.

McNeil (49o23'N, 115o59'W): An extensive surface diamond drilling program was conducted by Bapty Research Ltd.

Pine (49°37'N, 115°50'W): An extensive surface diamond drilling program was undertaken by the Victoria Research Corporation.

Price (49°33'N, 116°02'W): Kokanee Exploration Ltd. undertook a surface diamond drilling and trenching program.

Roo (49°01'N, 115°01'W): Teck Exploration conducted a surface diamond drill program.

Vine (49°26'N, 115°50'W): An extensive surface drilling program was conducted on a mineralized vein structure (gold, silver, lead, zinc) by Kokanee Exploration Ltd.

4.1.5. Inspection District #12

OPERATING METAL OR COAL MINES:

BALMER

Lat.49°45' Long.114°45' (82G/16W)

The Balmer open pit coal operations are located on Harmer Ridge, five km southeast of Sparwood, B.C. The preparation plant is located in the Elk Valley, three km from Sparwood.

The mine is owned by Westar Mining Ltd., 1900-1176 West Georgia Street, Vancouver, B.C., V6E 4B9. The mine office address is P.O. Box 2000, Sparwood, B.C., V0B 2G0.

The Balmer operations are located on a syncline at the north end of the Fernie Basin. The area is underlain by the Kootenay Formation which is a series of interbedded sandstones, mudstones, siltstones, shales, conglomerates and coal seams up to 665 metres in thickness. In the area of the mine up to 18 metallurgical coal seams are evident. The seams generally dip at 15-20o and are disturbed by numerous thrust faults.

This is the largest open pit coal mine in the world, with production in the area dating back to the turn of the century. Mining is by open pit, truck and shovel methods on 15 metre benches; product is a low volatile bituminous coal. After treatment in the Elkview preparation plant, the coal is hauled to the Roberts Bank terminal in unit trains. The majority of metallurgical coal produced from the Balmer mine is sold to nine Japanese corporations under an agreement expiring on March 31, 1993. Metallurgical coal is also sold to Pohang Iron and Steel Company Ltd. of Korea under long term-contracts extending through March 31, 1994, and to steel mills in 20 other countries throughout the world. Thermal coal is used primarily as a fuel for electrical power generation and other industrial purposes. The company's thermal coal is sold to customers around the world.

Until 1988, operations at the Balmer mine relied upon one main seam of coal for as much as 80% of the total raw coal produced at the mine. In 1990, the coal was derived from many seams and the main seam only made up approximately 45% of the total base product. Unfortunately, the different geology encountered in the seams required a greater quantity of waste material to be removed. Added to the difficult geological situation, severe weather and shutdowns taken to adjust clean coal inventories in the latter part of December, resulted in reduced production during the year. In addition, an eight-day shutdown at the Balmer mine in July occurred as a result of accidental damage to the conveyor which transports coal from the pit operations to the processing plant.

In 1989 the company recognized that the fleets of rock moving equipment at Balmer were beyond their economic life and no longer well matched to the mine's geology; therefore, the company began the process of renewal with a test rental program on three pairs of new 190 and 240 ton haul trucks. By the end of 1990 this groundwork led to an agreement to lease ten new 240 ton trucks with options to acquire up to 30 additional units over a five-year period. The company expects that a similar program will be initiated in 1991 on the shovel fleet.

Total average employment at the Balmer mine was 1,265 during 1990.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.51.
_____. Mining in British Columbia, 1981-1985, p.74.
_____. Mining in British Columbia, 1986-1987, p.69.
_____. Coal in British Columbia, Paper 1986-3, p.25.
MI 82G/NE-11,13,14,16,23.
Westar Mining Ltd., Annual Report, 1990.

BYRON CREEK COLLIERIES (COAL MOUNTAIN MINE)

Lat.49°30' Long.114°40' (82G/10E)

This open pit metallurgical and thermal coal mine is located near the old townsite of Corbin, approximately 35 km southeast of Sparwood, B.C., and 30 km east of Fernie, B.C. Access is via 25 km gravel road south from Highway 3.

Byron Creek Collieries Limited is a wholly-owned subsidiary of Esso Resources Canada Ltd., Esso Plaza, 237-4th Avenue SW, Calgary, Alberta, T2P 0H6.

The Coal Mountain operations are located on the eastern edge of the Crowsnest Coalfield. Coal Mountain comprises complex folded and faulted Jura-Cretaceous sedimentary rocks. One sub-bituminous coal seam is being mined, which averages about 30 metres in thickness.

The property is located at the old Corbin minesite, which was in production between 1908 and 1935. It is now an open pit truck and shovel mine, producing thermal and weak coking coal. The raw coal is crushed in a rotary breaker, cleaned and dried, then loaded on rail cars at the loadout facility. The mine produces 1.6 million tonnes per year for electric power generation in Ontario and the Pacific Rim.

In the fall of 1990, Esso Resources Canada Ltd. put Byron Creek Collieries mine up for sale. Total average employment in 1990 was 323.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.50.
_____. Mining in British Columbia, 1981-1985, p.71.
_____. Mining in British Columbia, 1986-1987, p.70.
_____. Coal in British Columbia, Paper 1986-3, p.26.
MI 82G/NE-1.

FORDING

Lat.50°12' Long.114°52' (82J/2W)

The Fording open pit coal mine lies in the upper Fording River Valley, 68 km north of Sparwood. Access is via 30 km of paved road northeast of Elkford, B.C.

Fording Coal Limited is owned by Canadian Pacific Limited, 200-205 9th Avenue SE, Calgary, Alberta, T2G 0R4.

The property is in the northern section of the Elk Valley coalfield in the Fording River Valley. Medium to high volatile coal measures are contained in the Mist Mountain Formation of the Juro-Cretaceous Kootenay Group. This interbedded sequence of sandstone, siltstone, mudstone and coal has been folded into two broad, asymmetric synclines. The intervening anticline has been faulted then eroded.

Production at Fording commenced in the early 1970s. The mine operates on both sides of the Fording River with the office, maintenance site and preparation plants located on the east side at the base of Eagle Mountain. The mine is open-pit, involving multi-seam truck and shovel operations and one dragline. The coal is shipped by rail to Westshore Terminals and Thunder Bay, for sale to both domestic and export markets.

Total average employment in 1990 was 1,007.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.51.
_____. Mining in British Columbia, 1981-1985, p.73.
_____. Mining in British Columbia, 1986-1987, p.70-71.
_____. Coal in British Columbia, Paper 1986-3, p.24.
MI 82J/SE-9, 12.

GREENHILLS

Lat.50°10' Long.114°50' (82J/2W)

The Greenhills open pit coal mine is located 40 km north of Sparwood, B.C., and 10 km northeast of Elkford, B.C., in the upper Elk Valley. Access is via road from Elkford.

The operations are owned by Westar Mining Ltd., 1900-1176 West Georgia Street, Vancouver, B.C., V6E 4B9.

The property is nearly midway along the Elk Basin, which is the northern section of the Crowsnest Coalfield. The seams are contained in the coal-bearing member of the Kootenay formation within an elongate synclinal formation trending north-northwest. Numerous small-scale normal and thrust faults complicate mining on the east limb and axis of the syncline. Twenty-nine seams are known to exist; however only a few are economic to mine. The coals are of medium-volatile bituminous rank, and of high-volatile A bituminous rank.

The Greenhills mine began to produce metallurgical coal in 1983. The operation is an open pit, multi-seam coal mine, using conventional truck and shovel methods. Two main end products are produced for the export market: high quality metallurgical coal and raw thermal coal at about 15% ash. These products are shipped by train to Westshore Terminals at Roberts Bank. Greenhills metallurgical coal is sold to nine Japanese corporations under annual contracts which expire on March 31, 1991, with the possibility of extension until 1993. Metallurgical coal is also sold to Pohang Iron and Steel Company Ltd. of Korea under long term-contracts extending through March 31, 2002, and to steel mills in 20 other countries throughout the world. Thermal coal is used primarily as a fuel for electrical power generation and other industrial purposes. The company's thermal coal is sold to customers around the world.

The company reports that the Greenhills mine met every key production and financial target in 1990 despite the fact that unusually severe winter weather in December caused interruptions and delays in both shipments from Westshore Terminals and production at the mine. Nevertheless, the company has initiated programs aimed at cost reduction and productivity improvements. In addition, the company reached a new four year collective agreement with the Greenhills Workers Association which represents 80% of the employees at the mine.

Total average employment in 1990 was 631.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.51.
_____. Mining in British Columbia, 1981-1985, pp.74-75.
_____. Mining in British Columbia, 1986-1987, p.71-72.
_____. Coal in British Columbia, Paper 1986-3, p.24.
MI 82J/SE-7.
Westar Mining Ltd., Annual Report, 1990.

LINE CREEK

Lat.49°57' Long.114°46' (82G/15W)

The Line Creek open pit coal mine site is located in the Crowsnest Pass area, approximately 24 km northeast of Sparwood, B.C. and 14 km southeast of Elkford, B.C. The plant site, located adjacent to the C.P. railway spur-line to Fording Coal, is situated 9 km downstream from the mine. Access is via an eastern turnoff from Highway #43, midway between Sparwood and Elkford.

Crows Nest Resources Limited, P.O. Box 2003, Sparwood, B.C., is owned by Shell Canada Limited, 400-4th Avenue SW, Calgary, Alberta, T2P 0J4.

The Line Creek property is situated on the west limb of the Alexander Creek syncline, near the south end of the Elk Valley Coalfield. The coal lies in the Kootenay Formation and is deposited in ten seams, of which seven are being mined in the current pit. These seven seams are thicker than 2.8 metres and have an aggregate thickness of up to 55 metres. Ninety percent of the reserves are in the four lower seams. The product is a low-medium volatile metallurgical grade bituminous coal, with the oxidized outcrop marketed as thermal coal.

Production began in 1982, with the metallurgical plant coming on stream in 1983. This is an open-pit mine, mining 12m benches using conventional truck and shovel methods. In 1987, production began from the Lower South pit adjacent to the main pit.

The mine exports thermal and metallurgical coal to countries in the Pacific Rim, Europe and South America.

Total average employment in 1990 was 474.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.72.
_____. Mining in British Columbia, 1986-1987, p.72.
_____. Coal in British Columbia, Paper 1986-3, p.25.

MI 82G/NE-20

NON-OPERATING MINES/MINE CLOSURES:

There were no permanent major mine closures during 1990.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Bull River: Robert Stanfield Holdings conducted an extensive drilling program on this gold property.

HQ Property: A 10,000 ton bulk coal sample received project approval in August, 1990.

4.1.6. Summary of Activities

The Kootenay Mine Development Review Committee (KMDRC), chaired by Andrew Whale, is administered from the Fernie office, although all meetings are held in Cranbrook. The following projects were part of the KMDRC review during 1990:

Fording Coal Ltd.	Henretta Dragline	(District 12)
Line Creek Ltd.	M.S.A. North Project	(District 12)
Westar Mining Ltd.	Balmer West	(District 12)
Byron Creek Collieries Ltd.	South Mine Expansion	(District 12)
Kokanee Exploration Ltd.	Vine Property	(District 6)
Domtar Gypsum Ltd.	Lussier River South	(District 6)
St. Paul Minerals	Moose Creek Magnetite	(District 6)

Mines in the region distinguished themselves during the year:

At the 1990 Open Pit Mine and Quarry Awards, Baymag Mines Ltd., and Westroc Industries Ltd., were awarded an "A" Trophy for achieving a zero accident frequency rate during the year. Queenstake Resources Ltd's large placer gold operation on the Moyie River, and Domtar Ltd's open pit gypsum mine were awarded certificates of achievement for their low accident frequency rates.

Although the mine itself was closed for most of the year, a team from Cominco Ltd's Sullivan Mine competed in and won the Provincial Underground Mine Rescue Competition.

Westar's Greenhills operation took first place, and Crows Nest Resources Ltd's Line Creek Mine took second, in The East Kootenay Mine and Industrial Safety Association district surface mine rescue competition. In addition, both Westar's Greenhills and Balmer Operations Three-Person First Aid Teams went on to compete in the provincial first aid competition, which was won by Greenhills.

For complete details of these competitions and awards, see Sections 5.4 and 5.5.

4.2 KAMLOOPS REGIONAL OFFICE

4.2.1. Office Address

200-2985 Airport Drive, Kamloops, B.C., V2B 7W8.
Tel: (604) 828-4566
Fax: (604) 828-4726

4.2.2. Office Personnel

During the year, office personnel included:

E. Sadar	District Inspector and Resident Engineer
F.J.T. Hancock	District Inspector and Resident Engineer/Office Administrator
J.E. Beswick	Inspector of Mines
H.P. Seguin	Inspector of Mines
R. Heistad	Inspector of Mines - Mechanical
L. MacCulloch	Secretary
J. Worsfold	Office Assistant
L. Wilms	Office Assistant

4.2.3. Area of Responsibility

The Kamloops Regional Office is responsible for Inspection Districts #3, #4, #14 and #15, lying in the south-central portion of the province (see Map 1). The District Inspectors responsible are F.J.T. Hancock for Districts #3, E. Sadar for Districts #4 and #14, and J.E. Beswick for District #15.

4.2.4. Inspection District #3

OPERATING METAL OR COAL MINES:

BLACKDOME

Lat.51°20' Long.122°29' (92O/8W)

The Blackdome open pit and underground gold/silver mine is located near the peak of Blackdome Mountain, 70 km northwest of Clinton, B.C. Access is via road off Highway 97, crossing the Fraser River near Gang Ranch.

The mine is owned by Blackdome Mining Corporation, 852-409 Granville Street, Vancouver, B.C., V6C 1T2.

The deposits occur within a gently dipping sequence of Tertiary volcanic and volcanoclastic formations, transected by steeply dipping northeast-trending normal faults. The fault zones have provided channels for epithermal mineralization, and contain variable amounts of gouge, clay alteration, silicification, and gold-silver bearing quartz veining. The mineralized volcanics are overlain by younger basalts which form the crest of Blackdome Mountain. Gold and silver mineralization usually consists of less than one percent dissemination of fine- to medium-grained electrum, acanthite, tetrahedrite, friebergite, chalcopyrite, pyrite, and silver sulphosalts. Quartz veining occurs as multiple stringers and stockworks up to six metres in width, and single veins up to three metres in width.

This gold/silver operation opened in May, 1986, and produced 200-250 tonnes of ore per day which was transported to the mill and processed into a dore gold product. Most of the ore came from four underground levels, while some 5-10% of the mill feed was from the open pit.

During 1990, total average employment at Blackdome was 102. The mine exhausted reserves and suspended mining operations in November, 1990. The concentrator continued to treat stockpiled ore into January, 1991.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.4-5.
_____. Mining in British Columbia, 1986-1987, p.47-48.

MI 920-51

HIGHLAND VALLEY COPPER

Lat.50°29' Long.121°02' (92I/6E)

This open pit copper, molybdenum operation is located in the Highland Valley, 15 km west of Logan Lake, B.C. It is accessed by highway from Ashcroft, Kamloops, and Merritt, B.C.

The mine is operated by Highland Valley Copper, 3000, 700 West Georgia Street, P.O. Box 10024, Pacific Centre, 3000-700 West Georgia Street, Vancouver, B.C., V7Y 1A1, a partnership of Cominco Ltd., (50%); Rio Algom Ltd., (33.6%); Teck Corporation (13.9%); and the Highmont Mining Company (2.5%).

The mine is situated in the central core of the Upper Triassic Guichon Creek batholith, which consists of several intrusive phases and varieties of calc-alkaline igneous rocks. The youngest phase (Bethsaida) is the host rock and is porphyritic granodiorite, medium- to coarse-grained, with coarse phenocrysts of quartz and biotite. The main sulphide minerals are bornite and chalcopyrite which are associated with a quartz-sericite stockwork system, as well as sericite-rich alteration zones. Pyrite and molybdenite form a weak halo around the edge of the orebody, and a relatively narrow oxide zone occurs in the upper portion of the orebody.

Highland Valley Copper is an amalgamation of the Valley Copper (1983), Highmont (1980), Lornex (1972) and Bethlehem (1962) operations and, in terms of tonnages of ore mined and milled, is one of the largest copper mines in the world.

Most of the copper concentrate produced at Highland Valley Copper is sold under long-term contracts to smelters in Japan, other Far East countries, Spain, and elsewhere. Part of Highland Valley Copper's molybdenum production is sold as concentrates worldwide, with the balance converted to molybdic oxide and sold to customers in Canada and Japan.

The Bethlehem Mill was taken off standby status and permanently closed in February 1990. This decision was taken once the two mill lines moved from the Highmont site to the Highland Mill performed with a capability essentially as had been predicted in the design studies.

During the year, a record high tonnage was processed by the Highland Mill. The mine also achieved record tonnages as nearly 96 million tonnes were removed from the Valley and Lornex pits. The emphasis on reducing costs and improving efficiencies and productivity was continued in 1990. In addition to the computer-assisted truck dispatch system and the shovel payload weighing system which became operational in the mine, improvements were made in the operation of the mill.

Total measured and indicated ore reserves at year-end were estimated to be 761,300,000 tonnes, averaging 0.408% copper and 0.0072% molybdenum. The company reports this implies a mine life of 16 years at current production levels.

During 1990, average employment at the mine totalled 1,230.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.8-9 (Lornex) and pp.9-10 (Valley Copper).
_____. Mining in British Columbia, 1986-1987, p.51-52.
MI 92I/SW12.
Rio Algom Ltd., Annual Report, 1990.
Highland Valley Copper, 1990 A Year in Summary.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

NAME: Pavilion Lake
TYPE: Quarry
PRODUCT(S): Limestone
LOCATION: 50°49'N 121°39'W
OWNER(S): Continental Lime Ltd.; Pavilion Indian Band

NON-OPERATING MINES/MINE CLOSURES:

Blackdome (51°20'N, 122°29'W) exhausted reserves and suspended mining operations in November, 1990. The concentrator continued to treat stockpiled ore into January, 1991.

Frenier (Aurun) (51°20'N, 122°21'W): This open cut perlite mine, owned by Aurun Mines Ltd., has not operated since 1988.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company
Last Chance	Gold	50°54'N 120°57'W	Minnova Inc.
Perkins Peak	Gold, Silver	51°50'N 125°04'W	Kleena Kleane Gold Mines Ltd.
Rayfield	Copper, Gold	51°19'N 121°06'W	Brenda Mines Ltd.
Taseko	Copper, Gold	51°05'N 123°24'W	Westpine Metals Ltd.

4.2.5. Inspection Districts #4 and #14

OPERATING METAL OR COAL MINES:

BEAVERDELL (Highland Bell)

Lat.49°26' Long.119°04' (82E/6E)

This undergound silver mine is situated on Wallace Mountain immediately east of Beaverdell, B.C., and 60 km south of Kelowna, B.C.. The mill and tailings pond are located on the west side of the West Kettle River, and the concentrator is on the flat below Beaverdell.

The mine is owned by Teck Corporation, 1199 West Hastings Street, Vancouver, B.C., V6E 2K5.

The ore is contained in highly fractured and faulted quartz and calcite veins. These veins are found in a large body of quartz diorite which extends into the sedimentary Wallace formation to the east. The veins contain galena, sphalerite, chalcopyrite and pyrrhotite, with occurrences of pyrargyrite and native silver. The mineralization may extend for short distances into the wall rock where it has been altered.

This underground mine is one of the oldest in the district. The ore is mined by open stoping methods using conventional narrow vein mining methods. Broken ore is trammed to the surface bins then trucked to the mill. After crushing and grinding, concentration is carried out to produce a jig concentrate and two flotation concentrates which are transported by truck to the smelter at Trail, B.C.

The mine has produced over 40 million ounces of silver since production began in 1898. At year-end, Teck Corporation announced that it would be suspending operations at the Beaverdell mine early in 1991. However, operations could resume if silver prices improve and if the potential for higher grade ore is realized. Total average employment in 1990 was 34.

References:

B.C. Minister of Mines. Annual Report 1949, pp.145-148.
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.8.
_____. Mining in British Columbia, 1981-1985, p.6.
_____. Mining in British Columbia, 1986-1987, p.49-50.
MI 82E/SW-30, 72, 133.

BRENDA

Lat.49°53' Long.120°01' (92H/16E)

The Brenda open pit copper/molybdenum operations are situated 22 km northwest of Peachland, B.C., and 2.5 km southwest of Brenda Lake. Access is via 29 km of road (19 km paved and 10 km gravel) from Peachland.

The mine is 69% owned by Noranda Inc., and operated by Brenda Mines Ltd., P.O. Box 420, Peachland, B.C., V0H 1X0

The orebody is within the Brenda Stock, a composite quartz diorite to granodiorite body of Jurassic age which intrudes rocks of the Upper Triassic Nicola Group. It is cut by pre-ore and post-ore dykes of divergent composition. Mineralization is confined almost entirely to veins, most of which are quartz veins. Chalcopyrite and molybdenite are the main sulphides, accompanied by minor and variable amounts of pyrite and magnetite. Grade is a function of the density of fracturing and mineralogy of the veins. Alteration is generally confined to narrow envelopes bordering veins.

The mine commenced production in 1969. The orebody is mined by conventional open-pit methods, and both copper concentrate and molybdenum concentrate are produced. The molybdenum concentrate is further upgraded by hot chloride leaching to reduce the presence of copper and lead.

The Brenda mine was forced to close earlier than expected because of pit wall movements during spring breakup, 1990. Originally scheduled to close at the end of the year due to exhaustion of reserves, the mine ceased operation on June 8, 1990. An Industrial Adjustment Committee was established to assist the 190 Brenda employees in finding new jobs. Plans included family assistance, retraining and co-ordination of job search activities. A "Public Surveillance Committee" was also formed by the provincial government, and chaired by Ed Beswick, Inspector of Mines, to monitor the shutdown and oversee the progress of reclamation and environmental protection.

Following closure of the mine, Brenda Mines Ltd., received the Canadian Mental Health Association's award for "Excellence in Employee and Family Assistance" to recognize the company's initiatives to improve the overall well-being of their employees.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, pp.26-27.
_____. Mining in British Columbia, 1981-1985, p.19.
_____. Mining in British Columbia, 1986-1987, p.60-61.
C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.186-194.
MI 92H/NE-47.
Noranda Inc., Annual Report, 1990.

NICKEL PLATE

Lat.49°22' Long.120°02' (92H/8E)

This open pit gold/silver operation is located 6 km north of Hedley and about 40 km west of Penticton, B.C. Main access is from Penticton, via Apex Mountain Road and Nickel Plate Lake Road.

The mine is owned by Corona Corporation, 1900-120 Adelaide Street West, Toronto, Ontario, M5H 1T1.

The ore occurs in beds of the Nickel Plate Formation, where silicification has taken place forming skarn minerals. Ore concentration is controlled by intrusive dioritic dykes and sills which separate the mineralized beds. Gold occurs as minute grains in association with arsenopyrite and bismuth tellurides, and as electrum associated with late stage intergrowths of chalcopyrite, pyrrhotite, and sphalerite. Silver, copper, and cobalt are lesser minerals. Proven and probable reserves at year-end were 2,996,000 tons grading 0.081 oz/ton gold (including the Canty deposit).

The Nickel Plate mine was operated as an underground mine before 1930 and from 1934 to 1955. One of Corona's predecessor companies began production from three open pits on the 2,988-hectare property in 1987.

During 1990, several steps were taken to increase mine efficiencies, including increasing the capacity of the mill from its initial design capacity of 2,700 tons per day to 4,000 tons per day. Total throughput increased by 7% over 1989 and helped compensate for a 10% reduction in ore grade, so that production was only 6% less than in 1989. Direct operating costs per ounce of gold also declined by 6%. By the end of 1990, the south and central pits were mined out and ore from the larger north pit was being supplemented by material from the neighbouring Canty deposit. Corona acquired the Canty claims in May 1990, built an access road to the property and began pre-stripping of the deposit in September.

Despite intensive effort, the Nickel Plate Mine has been unable to maintain cyanide concentrations in the tailings pond below the limits prescribed in its waste management permit. Consequently a decision was taken to install a new treatment system using sulphur dioxide to destroy the cyanide. The new system is scheduled to be in operation by the end of 1991.

At the end of 1990, Nickel Plate had 173 employees. The mine is expected to continue operations through 1993.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, p.21.
_____. Mining in British Columbia, 1986-1987, p.61-62.
MI 92H/SE62.
Corona Corporation, Annual Report, 1990.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

There are no industrial mineral or structural material mines in this district which produce more than 100,000 tonnes per year.

NON-OPERATING MINES/MINE CLOSURES:

Brenda Mine (49°53'N, 120°05'W): Operations ceased permanently at the Brenda Mine on June 8, 1990.

Dankoe Mill (49°03'N, 119°41'W): The Dankoe Mill, which produces gold and silver concentrates, did not operate in 1990.

Goldstream Mine (51°38'N, 118°27'W): Goldstream Mine, an underground copper/zinc mine owned by Bethlehem Resources Corp., shut down in 1984. However, in 1990 some surface drilling and mine rehabilitation took place. Project financing of up to $7 million for the reactivation of the Goldstream mine is being provided by Nippon Mining Co., and Sumitomo Corporation. The mine is expected to produce 25 million pounds of copper and seven million pounds of zinc annually.

Skylark (O.B.) 49°05' 118°37' Skylark Resources Ltd: This underground silver/gold mine closed in April, 1989 due to declining silver prices.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company
Crystal Peak Garnet	Industrial Garnet	49°24'N, 119°55'W	Polestar Exploration Inc.
Elk	Gold	49°50'N, 120°19'W	Fairfield Minerals Ltd.
Golden Crown	Gold, Copper	40°05'N, 118°35'W	Attwood Gold Corp.
J. & L	Gold,Silver,Lead,Zinc(U/G)	51°17'N, 118°08'W	Cheni Gold Mines Inc.
Mam	Gold (Underground)	49°03'N, 119°33'W	Toba Gold Resources Inc.
Orifino Mountain	Gold, Silver	49°15'N, 119°41'W	Orequest Consultants Ltd.
Rainbow - Tam O'Shanter	Gold, Silver	49°02'N, 118°40'W	Minnova Inc.
Rift	Silver, Lead, Zinc, Copper	51°54'N, 118°32'W	9041 Investments Ltd.
Sil	Marble	49°13'N, 119°45'W	E. Carson
Silver Dawn	Lead, Zinc, Silver	49°06'N, 118°55'W	Rock Creek Resources Ltd.
Top	Gold, Silver (Underground)	50°04'N, 118°33'W	Commonwealth Gold Corp.
Vault	Gold, Silver	49°22'N, 119°37'W	Canadian Nickel Co. Ltd.

4.2.6. Inspection District #15

OPERATING METAL OR COAL MINES:

AFTON

Lat.50°39' Long.120°30' (92I/10E; 92I/9W)

The Afton open pit copper/gold/silver mine is alongside the Trans-Canada Highway, 13 km west of Kamloops, B.C., at 640 metres elevation.

The mine is owned by Teck Corporation (73%), 1199 West Hastings Street, Vancouver, B.C., V6E 2K5.

Copper mineralization at the Pothook deposit consists mainly of chalcopyrite with chalcocite, bornite and native copper. The Crescent deposit is on the northern contact of the Iron Mask Batholith and consists mainly of chalcopyrite, occurring as blebs and disseminations. The Ajax deposit lies at the southern contact of the Iron Mask Batholith as a multi-unit intrusive body. Copper mineralization is associated with the Sugarloaf Diorite, a younger intrusive phase typically of fine-medium grained porphyritic diorite. Chalcopyrite is the predominant copper mineral and the only one of economic significance. It occurs as blebs and disseminations, in fractures, veinlets and microveinlets, and occasionally in breccias and vugs with accompanying calcite. Gold mineralization is closely associated with chalcopyrite mineralization.

The Afton mine is a large open pit copper operation which came into production in 1977. Mining at the original Afton pit ceased in July, 1987 at which time the Pothook pit, located two km southwest of the plant site, was brought into production. This pit was mined until October, 1988 when reserves were exhausted and the Crescent pit, located three km east of the plant site, was brought into production. A 1988 decision to place the Ajax deposit into production will extend the life of the Afton operation by seven to eight years.

During 1990, the company completed the installation and commissioning of an in-circuit pebble crusher and screening system which increased mill throughput to 8,500 tonnes per day. The Ajax East pit was pre-stripped and put into production, and a diamond-drill program was carried out in the Ajax West Zone to define ore reserves for ultimate development.

Total average employment in 1990 was 208.

References:

B.C. Ministry of Energy, Mines & Pet. Res. G.E.M., 1972, pp.209-220.
_____. Mining in British Columbia, 1975-1980, Vol. 1, pp.11-12.
_____. Mining in British Columbia, 1981-1985, p.7.
_____. Mining in British Columbia, 1986-1987, p.50-51.
C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.376-387.
MI 92I/NE-23,26,30.

SAMATOSUM

Lat.51°10' Long.119°47' (82M/4W)

This open pit silver/gold/copper/lead/zinc property is located on Samatosum Mountain near the town of Barriere, about 100 km north of Kamloops, B.C. It is accessed by 39 km of road from Barriere, via the Agate Bay road.

The project is owned by Minnova Inc., Samatosum Division, Suite 3970, P.O. Box 91, Commerce Court West, Toronto, Ontario, M5L 1C7 (70%) and Rea Corporation, World Trade Centre, 536-999 Canada Place, Vancouver, B.C., V6C 3E1 (30%).

The deposit lies within the Eagle Bay Assemblage of strongly foliated and overturned Paleozoic rocks in association with mafic pyroclastics, sericitic tuffs, cherts, muddy tuffs and sediments. The Muddy Tuff unit is often well mineralized with up to 60% pyrite, minor zinc-lead-copper, and up to 60g/tonne silver over thicknesses of 10-15 metres. Much of the orebody is a stratabound quartz vein, with lesser portions of mineralized and altered wall rock materials. The flat, plunging, tabular orebody averages approximately six metres in thickness and is 500 metres long by 80 metres high. Economic mineralization consists of tetrahedrite, the principal silver mineral, sphalerite, galena, chalcopyrite and electrum.

During the first half of 1988, activities focussed on a feasibility study and preparation of a Stage I Report. The Report was approved, and Approval-in-Principle granted, by November, 1988. By year end development had begun, with construction of the mine access road, plant site, tailings dam, building foundations and other related facilities underway.

The Samatosum mine was completed ahead of schedule and within budget. The mill operated at nominal capacity of 450 tonnes per day since operation began in July, 1989. By early 1990, the recovery rates increased substantially over those achieved during the tune-up phase. Milling is by conventional flotation methods to produce a silver-copper concentrate, a zinc concentrate and a lead concentrate.

The mine is an open pit operation but in the later years of the mine life there may be a transition into underground reserves.

Total average employment in 1990 was 92.

References: MI 82M-244.

SIMILCO (Similkameen)

Lat.49°20' Long.120°33' (92H/7E)

The Similco open pit copper/silver/gold mine is situated 15 km west of Princeton on the Hope-Princeton Highway.

Similco Mines Ltd., is wholly-owned by the Princeton Mining Corporation, #2000 - 1055 West Hastings Street, Vancouver, B.C. V6E 3V3. The mine address is P.O. Box 520, Princeton, B.C. V0X 1W0

The original mining operation at the Similco mine site, the Copper Mountain mine, closed in 1957. In 1971 Newmont Mining Corporation reactivated mining in the camp. With the company's purchase of Similco from Newmont in 1988, commitments have been made to extend the mine life into the mid-1990s.

All of the known copper deposits lie in a 1,100 metre by 4,300 metre belt of Nicola volcanic rocks, bounded on the south by the composite Copper Mountain stock and on the north by the Lost Horse intrusive complex. It is believed that the Copper Mountain intrusions, the mineralization associated with them, and the volcanic rocks, are all of late Triassic age. Fluids producing alteration and mineralization came from the Lost Horse complex of porphyries and porphyry breccias. Alteration is intense, involving biotite, later pink feldspar, and scapolite. Mineralization of chalcopyrite and bornite is in fracture fillings and disseminations. Pegmatite veins, containing potash feldspar, biotite, and striking masses of bornite occur up to 2.3 metres thick. At year-end 1990, mineral reserves totalled 167,800,000 tons grading 0.40% copper.

This is a conventional open-pit mine. The ore is crushed at Copper Mountain then transported via cable conveyor over a suspension bridge to the concentrator. The concentrate is trucked to Vancouver for shipment.

Mining plans for 1990 were based on mining the majority of ore from the newly developed Pit 1. Ore from this pit however, was found to be much harder and finer grained than expected. Consequently, the

metallurgical performance was below expectations and revisions to the mine plan were necessary to accommodate the more difficult ore and maintain production goals. Changes to the mine plan necessitated raising the cut-off grade and increasing the waste mining requirements. This change prolonged mining at a higher rate than anticipated resulting in higher operating costs. Mining was back on track at year-end and a reduced mining rate was announced early in 1991.

Copper recovery was similar to that achieved in 1989, although this improved in the last quarter following the installation of 38 additional flotation cells designed to enhance the rougher flotation recovery. As well, new ring gears were purchased and installed in the semi-autogenous grinding mills.

Continued exploration is expected to generate further mineable reserves. The company advises that the extent to which the balance of the reserves will be mined will depend on future copper prices, operating costs and taxes. The Similco Mine employed an average of 329 persons in 1990.

References:
B.C. Ministry of Energy, Mines & Pet.Res. Bull. 59, Geology of Copper Mountain, British Columbia, 1972.
_____. Mining in British Columbia, 1975-1980, Vol.1, pp.28-29.
_____. Mining in British Columbia, 1981-1985, pp.22-23.
_____. Mining in British Columbia, 1986-1987, p.62-63.
C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.368-375.
MI 92H/SE-13.
Princeton Mining Corporation, Annual Report, 1990.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

There were no industrial mineral or structural material mines producing more than 100,000 tonnes per year in 1990.

NON-OPERATING MINES/MINE CLOSURES:

There were no mine closures during 1990.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Name of Project	Type of Project	Location	Name of Company
Birk	Copper, Lead, Zinc	51°25'N, 119°55'W	Falconbridge Ltd.,
Chu Chua	Copper, Zinc, Silver, Gold	51°24'N, 120°05'W	Minnova Inc.,
Craigmont Tailings	Magnetite	50°12'N, 120°54'W	Craigmont Mines Ltd., M-7 Industries Ltd.
Virgina, Alabama	Copper, Gold	49°21'N, 120°30'W	Similco Mines Ltd., Princeton Mining Corp.

4.2.7. Summary of Activities

J.E. Beswick assumed the duties of District Inspector for District #15 in June, 1990.

Review and approval of existing mine expansions included the Samatosum Mine and Similco Mine.

A total of 232 Notices of Work were reviewed for mineral exploration, placer operations, sand and gravel pits, and quarries.

Other work of the office included:

- The inspection of producing mines and mineral exploration projects to audit and enforce compliance with the *Mines Act* and *Regulations*.
- The investigation of accidents, dangerous or unusual occurrences, applications for variance from *Mines Act* or *Regulation* requirements, and complaints from the public or industry.
- Review and amendments to reclamation permits.
- Administration of Regional Office systems and the contract inspection program.
- Participation in inter-agency local resource use plans and Regional Mine Development Review Committee activities.

Major projects before the South Central Mine Development Review Committee during the year included:

- Canty open pit mine project, Corona Corporation;
- Crystal Peak garnet project, Polestar Exploration Inc.,
- Brenda Mine closure;
- Union Mine heap leach reclamation project;
- Craigmont tailings project.

The Committee also made recommendations on requests for placer designations referred to them on the following streams: Crouse Creek, Winnifred Creek, Cairnes Creek, Goldstream River, B.X. Creek, and Crossman Creek/Gardom Creek.

4.3. NANAIMO REGIONAL OFFICE

4.3.1. Office Address

1A - 3411 Shenton Road, Nanaimo, B.C., V9T 2H1.
Tel: (604) 755-2486. Fax: (604) 755-2474

4.3.2. Office Personnel

During the year, office personnel included:

R. Bone	District Inspector and Resident Engineer/Office Administrator
E.W. Beresford	District Inspector and Resident Engineer
J.C. Alvarez	Inspector of Mines
H.A. Armour	Inspector of Mines
G. Peachey	Secretary
K. McKay/L. Quinn (aux.)	Office Assistant

4.3.3. Area of Responsibility

The Nanaimo Regional Office is responsible for Inspection Districts #7 and #8 (see Map 1). R. Bone is responsible for District #8 and E. Beresford for District #7. The office administers Branch programs in the Vancouver Island and Lower Mainland areas.

4.3.4. Inspection District #7

OPERATING METAL OR COAL MINES:

There are no large metal or coal operations in this district.

INDUSTRIAL MINERALS OR STRUCTURAL MATERIALS:

There are no major industrial mineral or structural material properties in this district. However, the district encompasses hundreds of small to medium-size operations, some of which narrowly miss the "major" categorization. An example is **Tri-Sil Minerals Inc.**, which commenced quarry operations on their wollastonite/limestone property at Sechelt. The operation supplies oxidized material to the cement industry, and is developing markets for the wollastonite-garnet products.

NON-OPERATING MINES/MINE CLOSURES:

The Carolin (Ladner Creek) mine is still on care and maintenance since its closure in 1984. This operation was taken over by the Anglo-Swiss Mining Corporation of Vancouver, which conducted further drilling and geological surface work during 1990.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Blue Mountain Developments Inc., has opened a shale/clay quarry north of Maple Ridge, to serve the domestic and export ceramics industries.

On **Fox Island** and at **Squamish**, dimensional stone quarries have been opened to serve export markets.

4.3.5. Inspection District #8

OPERATING METAL AND COAL MINES:

ISLAND COPPER

Lat.50°36' Long.127°28' (92L/11W,12E)

This open pit copper and molybdenum mine is located on Vancouver Island, 16 km south of Port Hardy, B.C., and 8 km east of Coal Harbour, B.C., on the north shore of Rupert Inlet. It is accessed by road from Port Hardy.

The mine is operated by BHP-Utah Mines Ltd., a wholly-owned subsidiary of BHP-Utah Minerals International Inc., 550 California Street, San Francisco, California, 94104. The mine address is P.O. Box 370, Port Hardy, B.C., V0N 2P0.

The orebody is an elongated ellipse, subparallel to the regional trend. It occurs within rocks of the Bonanza Group, including coarse to fine andesitic to dacite breccias and tuffs. Intrusive into the volcanic rocks is an irregular dyke of quartz-feldspar porphyry which dips at 45°-60° to the north. The orebody is draped about the dyke. The ore zone is strongly fractured, with chalcopyrite and molybdenite occurring in veinlets. About 75% of the ore is in volcanic rocks and the remainder, on both sides of the dyke, is in marginal breccia. Estimated reserves at fiscal year end were 132,900,000 tonnes grading .350% Copper and .017% Molybdenum.

Production began from this open-pit mine in late 1971. The type of mining employed is shovel/truck, with an in-pit crusher/conveyor. Annual production capacity is 20,384,000 tonnes mill feed (56,000 tpd through the concentrator). Copper concentrate is shipped to smelters in Japan, while molybdenum concentrate is dried, packaged into steel drums and trucked to Vancouver. Shipments to overseas markets are made through an adjacent port facility on Rupert Island.

During 1990 Island Copper was in the process of expanding the perimeter of its open pit to access additional ore reserves at depth. The first stage of the south wall "pushback" project was completed this year. Molybdenum production declined in 1990 as lower ore grades were countered. The mine employed an average of 549 people in the mining, milling, maintenance, warehouse, administration and laboratory operations. Production is expected to continue until 1997.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, pp.16-17.
_____. Mining in British Columbia, 1981-1985, p.12.
_____. Mining in British Columbia, 1986-1987, p.54-55.
C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.206-218.
MI 92F-62,99,135.
BHP-Utah Mines Ltd., Yearly Statistics, January 23, 1991.
BHP, Report to Shareholders, 1990.

MYRA FALLS OPERATION (Lynx, H-W)

Lat.49°34' Long.125°35' (92F/12E)

The Myra Falls underground copper/zinc mine is located on the west side of the south end of Buttle Lake, 60 km southwest of Campbell River, B.C. Access is via paved road, Highway 28, 90 km southwest of Campbell River. The mine is situated at the south end of Buttle Lake in Strathcona Provincial Park.

The operation is owned by Westmin Resources Ltd., Suite 904, 1055 Dunsmuir Street, P.O. Box 49066, The Bentall Centre, Vancouver, B.C. V7X 1C4. The mine address is P.O. Box 8000, Campbell River, B.C., V9W 5E2.

Ore deposits consist of massive sulphides, including pyrite, chalcopyrite, sphalerite, and galena, occurring in volcanic rocks of the Sicker Group. The Lynx mine is within a single structural stratigraphic zone 400 to 500 metres thick, which has been traced over a strike length of 6,000 metres. The mine area comprises segments of a zone of rhyolite, other volcanic rocks, and ore. The H-W mine is at a stratigraphic level 100 metres lower. In this area, rocks ranging from massive volcanic rock to breccias, tuffs, and clastic sediments have been affected by dynamothermal metamorphism.

This is a large operation mining copper, zinc, lead, gold and silver, which first came into production in 1967. Four separate underground mines have existed at this site: the Myra, Price, Lynx and H-W mines. Only the Lynx and H-W mines are now producing with current reserves at 9,975,000 tonnes.

The underground operations have shaft access to mechanized mining with scooptrams and boom jumbos. There is an on-site crusher and concentrator, rated at 4,000 tonnes per day. Annual production capacity is 1,320,000 tonnes. Myra Falls ships concentrates by road from Campbell River and then by sea to Korea and Japan.

During the year significant changes were introduced to improve productivity and ore grades and to reduce operating costs. Bulk mining techniques are replacing mechanized cut and fill methods in the H-W Mine. Mill operations received detailed assessments to improve zinc and copper recoveries and concentrate grades. Exploration continued to identify new targets near existing workings at both mines. During 1990, on-site exploration efforts replaced ore tonnes mined, and established the estimated remaining mine life at eight years, with potential for additional ore discoveries. The average number of employees in 1990 was 608.

Westmin is approaching a significant milestone in 1991 with the 25th anniversary of startup of its Myra Falls Operations.

References:

B.C. Minister of Mines. Annual Report, 1964, pp.157-166.
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, Vol.1, 1975-1980, pp.1-2.
_____. Mining in British Columbia, 1981-1985, p.2.
_____. Mining in British Columbia, 1986-1987, p.44-45.
C.I.M. Bull., Dec. 1980, pp.71-90.
MI 92F-71, 72, 73.
Westmin Mines Ltd., Yearly Statistics, February 7, 1991.

QUINSAM COAL

Lat.49°50' Long.125°33' (92F/14W)

This open pit and underground coal operation is located on Vancouver Island, southwest of Campbell River, B.C. Access is through the City of Campbell River via Highway 28, kilometre 20, then west on the mine access road for 10 km.

The mine is owned by Brinco Coal Corp., 1480-1055 West Hastings Street, Vancouver, B.C., V6E 2E9. The mine address is Kilometre 18, Highway 28, P.O. Box 938, Campbell River, B.C. V9W 6Y4.

The Quinsam coal measures are an erosional outlier of the Comox Formation, part of the Nanaimo Group. Coal measures are bounded and underlain by basement rocks of Triassic and Jurassic age. Coal is found in the Cumberland and Dunsmuir members of the Comox Formation, with siltstone, mudstone and sandstone. Major coal seams are the Quinsam No.1 and No.2 beds in the Cumberland member, which are well exposed in the Quinsam mine highwall, and the Quinsam No.3 and No.4 beds in the Dunsmuir member. Proven reserves total approximately 26 million tonnes.

Mining on a limited production scale began at the end of 1987, producing thermal coal at a rate of 15,000 tonnes/month from the open pit. During 1990, a new underground development was installed at the southeast end of Pit 2N. The underground operation underwent a trial period during January to May at

which time it was declared a commercial operation. The operation is truck/shovel for the open pit, with continuous miner, room and pillar underground. A dry crushing and screening plant is in operation with a coal washplant phasing in for 1991. The annual production capacity is now 250,000 tonnes from the surface operation and 100,000 tonnes from the underground operation.

The coal is trucked 29 km from the minesite on existing highway to the Middle Point Marine Terminal, 11 km north of Campbell River, B.C., and barged for export by ship from Texada Island.

Quinsam Coal is sold to utility companies, cement plants, and is sold on the spot market. The company has signed an agreement with the Chubu Electric Power Company of Japan to supply 100,000 tonnes of thermal coal annually to the new Hekinan power station. The contract is the first long-term agreement the company has undertaken with a Japanese power utility.

During 1990 an agreement was reached with Holnam Rock Products (Ideal Basic Industries Ltd.), to rehabilitate the ship loading facility at Texada Mines on Texada Island. This was accomplished in September and the facility can now accommodate gearless vessels of Panamax size (55,000 tonnes). The average number of persons employed at the Quinsam Mine is 74.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Coal in British Columbia, Paper 1986-3, p.30.
_____. Mining in British Columbia, 1986-1987, p.75.
MI 092F-319.
Quinsam Coal Corp., Yearly Statistics, January 8, 1991.

STRUCTURAL MATERIALS OR INDUSTRIAL MINERAL MINES

NAME:	Imperial
TYPE:	Open Pit
PRODUCT(S):	Limestone
LOCATION:	49o44'N, 124°23W'
OWNER(S):	Imperial Limestone Ltd.

NAME:	Holdnam West (Gillies Bay)
TYPE:	Open Pit
PRODUCT(S):	Limestone
LOCATION:	49°34'N, 124°30'W
OWNER(S):	Holdnam West Materials Ltd. (Purchased from Ideal Cement Co. during 1990)

NAME:	Blubber Bay
TYPE:	Open Pit
PRODUCT(S):	Limestone
LOCATION:	49°47'N, 124°37'W
OWNER(S):	Ash Grove Cement West Inc.

NAME:	Nanaimo
TYPE:	Open Pit
PRODUCT(S):	Shale
LOCATION:	48°00'N, 124°00'W
OWNER(S):	Dunsmuir Quarries Ltd.

NON-OPERATING MINES/MINE CLOSURES:
None in 1990.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Moraga Resources conducted surface drilling on its **Expo (Hushamu)** property which appeared to confirm the presence of a porphyry copper-gold deposit. The company is earning 45% interest in the property from **BHP-Utah Mines Ltd.** Moraga is also earning interest in the nearby **Red Dog** property from **Crew Natural Resources.** The two deposits are seen as potential replacements for depleting resources at BHP-Utah's **Island Copper Mine.**

Falconbridge Ltd., conducted surface drilling at its **Chemainus** gold/silver property.

Minnova Inc., conducted surface drilling at the **Lara** gold/silver property.

Westmin Mines Ltd./Nexus Resource Corporation, Debbie gold property near Port Alberni: Westmin has 62% interest in the adjacent **Yellow** claim. The 1990 exploration program focused on Gap Fault and 1050 Zone northwest and west of the 900 Zone. Trenching, ground geophysics surveys and small drilling programs were completed in November, 1990.

4.3.6. Summary of Activities

In District 7, the major mining activity continued to be in sand and gravel extraction and quarry stone products for the Vancouver, Lower Mainland and United States west coast markets. Some additional pits opened in 1990, increasing the total to 201 active permitted sand and aggregate pits. Mineral claim staking showed an increase, but less field work was performed due to adverse weather forcing closure of some roads and forests. The level of placer activity, centring around Hope, remained static during 1990.

The Vancouver Island Mine Development Review Committee under the chairmanship of R. Bone, reviewed the following main projects in 1990:

- **BHP-Utah Mines Ltd., Island Copper Mine South Wall** : Expansion and reclamation of the slurry wall to increase reserves by approximately 83 million tonnes.
- **Westmin Resources Ltd. - Myra Falls**: Reclamation plans for permit renewal, and the Lynx open pit backfill proposal.
- The **McAdam Resources' Spud Valley** bulk sample project was approved in 1988. However, this project went into receivership in 1990, and its reclamation bond confiscated.
- **Brinco Coal Corporation's Quinsam Coal Mine**. Approval of the expanded underground mine proposed surface processing plant and main power line into the mine.
- **Westmin Resources Ltd.'s Debbie property:** exploration drilling from the underground tunnel, and additional surface drilling and trenching.
- **Better Resources, Mount Washington:** Exploration work and reclamation of surface waste rock - ongoing environmental monitoring program for acid mine generation.

Safety-related matters which involved the Nanaimo office included:

- Investigations into two separate fatal accidents at Westmin Resources Ltd.'s H-W Mine at Myra Falls.
- A safety audit at the Myra Falls operation to examine all production aspects at the mine. The format to be used at other major mines throughout the Province to complement normal inspection programs.

The office also coordinated a contract inspection program for Districts #7 and #8.

4.4. NELSON REGIONAL OFFICE

4.4.1. Office Address

403 Vernon Street, Nelson, B.C., V1L 4E6.
Tel: (604) 354-6125
Fax: (604) 354-6120

4.4.2. Office Personnel

During the year, office personnel included:

M.A. Mellor	District Inspector of Mines
A.L. O'Bryan	Inspector of Mines - Reclamation
D. Roach	Inspector of Mines (seasonal, part-time)
S. Beatty	Secretary
S. Smith	Office Assistant

4.4.3. Area of Responsibility

The Kootenay Region is currently administered by two separate offices, one in Fernie and one in Nelson. The Nelson Regional Office is responsible for Inspection District #5 located in the West Kootenays. M.A. Mellor is the District Inspector.

4.4.4. Inspection District #5

OPERATING METAL OR COAL MINES:

SILVANA (Silmonac)

Lat.49°50' Long.117°11' (82F/14W)

The Silvana underground silver/lead/zinc mine is located on the east bank of Tributary Creek, 1.6 km west of Sandon, B.C. Access is via eight km of paved highway and six km of gravel road from New Denver, B.C.

The mine is owned by Treminco Resources Ltd., 1110, 625 Howe Street, Vancouver, B.C. V6C 2T6.

The deposit lies in the main Slocan lode; the structure being mined occurs as a lode within a strong shear that cuts Slocan Group sedimentary rocks and dips at 20-30 degrees. The oreshoots vary in width from a few centimetres to three metres, and can be considerably altered by graphite shearing. Lead and zinc mineralization, with significant silver content, occurs in veins, pods and lenses and is mainly in the form of argentiferous galena and sphalerite.

The mine essentially comprises the old Ruth Hope and Silversmith properties with operations dating back to 1927. The property had a series of operators until purchased by Dickenson Mines Ltd. in 1977. This is an underground silver mine using a subdrifter slash room and pillar method. Lead and zinc concentrates are produced and hauled to the smelter in Trail.

During the fourth quarter 1990, Dickenson Mines Ltd., sold the Silvana Mine to Treminco Resources Ltd. Dickenson report the sale was motivated by persistently low silver prices, by the small size of the mine, and the mine's incompatibility with Dickenson's long-term strategy.

During 1990, the total average number of persons employed was 38.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, pp.36-37.
_____. Mining in British Columbia, 1981-1985, p.27.
_____. Mining in British Columbia, 1986-1987, pp.64-65.
MI 82F/NW-50.

INDUSTRIAL MINERALS AND STRUCTURAL MATERIALS:

There are no industrial mineral or structural material mines in this district producing more than 100,000 tonnes per year.

NON-OPERATING MINES/MINE CLOSURES:

There were no reported closures during the year.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Alpine Gold (49°12'N, 117°27'W, 82F/11): Surface diamond drilling exploration was carried out by Cove Resources Ltd.

Clubine (49°14'N, 117°16'W, 82F/03W): Geochemistry, geophysics, diamond drilling and trenching were carried out by Yellowjack Resources Ltd.

Great Western Star (49°20'N, 117°W, 82F/06W): Surface diamond drilling, geochemical and geophysical surveys were conducted by Pacific Sentinel Gold Corp.

Hope (49°44'W, 117°25'N, 82F/11W): Surface diamond drilling was carried out by Kokanee Exploration Ltd.

Jo-Anne Property (49°25'N, 117°20'W, 82F/6): Road construction, diamond drilling and trenching were conducted by Snowwater Resources Ltd.

Joe Property (49°12'N, 117°19'W, 82F/03W): Surface diamond drilling was carried out by Fairbanks Engineering Ltd.

Katie (49o08'N, 117o20'W, 82F/03W): Diamond drilling, geophysical and geochemical work were conducted by Noranda Exploration Ltd.

Kena (49°25'N, 117°16'W, 82F/06W): Diamond drilling and geophysical and geochemical surveys were carried out by Noramco Exploration Co. Ltd.

Midnight Mine (49°04'N, 117°53'W, 82F/04): Matovich Mining Ltd. conducted underground exploration and development. 1500 tonnes of exploration ore was shipped to a mill at Northport, U.S.A.

Millie Mack (50°03'N,117°44'W, 82K/04): Dragoon Resources carried out diamond drilling exploration.

Nevada/Royal Canadian Group (49°24'N, 117°25'W, 82F/06E): Hibernia Developments Ltd. conducted underground sublevel exploration development in the Nevada mine, and underground rehabilitation in the adjoining Royal Canadian Mine.

Ore Hill-Summit (49°07'N, 117°08'W, 82F/03E): Yellowjack Resources carried out geochemical surveys and surface diamond drilling.

Player Group (49°25'N, 117°24'W, 82F/06W): Surface diamond drilling and trenching were conducted by Player Resources Ltd.

Rely (49°12'N, 117°27'W, 82F/03): Pegasus Gold Inc. carried out geochemistry, geophysics and surface diamond drilling.

Shaft (49°25'N, 117°15'W, 82F/06): Geochemical surveys and surface diamond drilling were conducted by Noramco Exploration Co. Ltd.

Silvana Mine (49°58'N, 117°15'W, 82F/14): Surface and underground diamond drilling was conducted by Treminco Resources Ltd.

Strawberry Flats (49°11'N, 117°54'W, 82F/04W): Cameco Ltd., carried out geochemical surveys, surface diamond drilling and trenching exploration.

Sullivan Two (49°03'N, 116°37'W, 82F/02E): Surface diamond drilling was conducted by White Knight Resources Ltd.

True Blue (49°53'N, 116°58'W, 82F/15W): Minequest Exploration Ltd. carried out surface diamond drilling.

White Water (49°23'N, 117°26'W, 82F/06W): Teck Corporation carried out geochemical and geophysical surveys and surface diamond drilling.

Wilds Creek (49°13'N, 116°34'W, 82F/02E): Kokanee Exploration Ltd. carried out surface diamond drilling.

4.4.5. Summary of Activities

An auxiliary Inspector of Mines was employed from May to November for the inspection of surface exploration projects, gravel pits and placer operations in Districts 5, 6 and 12. The inspector, whose time was shared between the Fernie and Nelson regional offices, focused on the environmental aspects of these projects.

In October, charges were laid by the Creston District Office of the Conservation Officer Service, and MEMPR Nelson regional office against two companies with regard to their exploration activities on Wynndel Mountain in the Creston area. The charges followed an investigation by both agencies of the release of drilling mud into Wilds Creek. Under the *Waste Management Act,* Kokanee Explorations Ltd. of Cranbrook was charged with one count of unlawfully introducing waste into the environment, and one count under the *Mines Act* of commencing work in or about a mine without having obtained a permit from the Chief Inspector of Mines. Connors Diamond Drilling of Kamloops was charged with unlawfully introducing waste into the environment.

The Nelson MEMPR office, with the assistance of all other district inspectors of mines, again collected data and arranged for the presentation for 1990's Safest Small Underground Mine in British Columbia, which award was won by Parson Barite. Full details of this and other competition results appear in Section 5.5.3.

4.5. PRINCE GEORGE REGIONAL OFFICE

4.5.1. Office Address

1652 Quinn Street, Prince George, B.C., V2N 1X3.
Tel: (604) 565-6125
Fax: (604) 565-6015

4.5.2. Office Personnel

During the year, office personnel included:

D. Turner	District Inspector and Resident Engineer, District 9
S.E. Wuschke	District Inspector and Resident Engineer, District 13
J.J. Sutherland	District Inspector of Mines, District 10
D. Miller	District Inspector of Mines, District 11
T. Burroughs	Secretary
N. Wood	Office Assistant

4.5.3. Area of Responsibility

The Prince George Regional Office is responsible for Inspection Districts #9, #10, #11 and #13 (see Map 1) covering the northeast quarter of the province.

4.5.4. Inspection District #9

OPERATING METAL OR COAL MINES:

BULLMOOSE

Lat.55°17' Long.121°26' (93P/3W)

The Bullmoose open pit coal mine is located 87 km south of Chetwynd, B.C., and 35 km northwest of Tumbler Ridge, B.C. It is accessed by following Highway 29 to Kilometer 71, then west along Bullmoose Creek for 18.5 km.

The Bullmoose joint venture is owned 61% by Teck Corporation, 29% by Rio Algom Ltd., and 10% by Nissho Iwai of Japan. The managing partner and operator is Teck-Bullmoose Coal Inc., 1199 West Hastings Street, Vancouver, B.C., V6E 2K5.

In two areas on the Bullmoose property the lower part of the Gates Formation occurs at shallow depth and with gentle dips; the northern portion is the "West Fork" area and the southern portion is the "South Fork" area. The West Fork area lies along the axial portion of a broad syncline and strata are generally flat lying for about two km along the structure. In the South Fork area, the lower Gates strata form a platter-shaped outlier which dips gently to the north and is crudely concordant with the slope. Erosion has exposed coal seams around the entire periphery of the South Fork area, and along the southern edge of the West Fork area. Five mineable seams have been identified that range from less than a metre to five metres in thickness, and have an aggregate thickness of approximately 12 metres.

This is a conventional truck and shovel operation. After treatment in the preparation plant, the coal is transported 35 km by truck to rail load-out silos 5 km from the town of Tumbler Ridge, from where it is hauled by unit train to the port at Ridley Island. The coal is sold to Japanese steel companies under contracts which provide for shipments of 1.7 million tonnes/year until 1999.

The operation has shipped 12.1 million tonnes of metallurgical coal since production commenced in 1984. 1990 revenue and operating profits increased from those reported in 1989 as the result of the resolution of uncertainties on sales prices affecting shipments from April 1989 to December, 1990. During the year, Bullmoose produced 1,535,000 tonnes of clean metallurgical coal. The company reports the mine has adequate reserves to satisfy existing contracts.

In 1990, the project employed an average of 336 workers; about 30% are mining, 15% in the wash plant, 45% in maintenance and plant services, and the remaining 10% in administration.

References:

B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.75-76.
_____. Mining in British Columbia, 1986-1987, p.73.
_____. Coal in British Columbia, Paper 1986-3, p.20.
MI 93P-1,12,16.
Rio Algom Ltd., Annual Report, 1990.

QUINTETTE

Lat.55°01' Long.121°13' (93P/3E)

The Quintette coal open pit mine site is located 120 km south of Chetwynd, B.C., and 12 km west of Tumbler Ridge, B.C. It is accessed either by Highway 29, or by the Heritage Highway through Tumbler Ridge, to the Quintette plant site.

The managing partner and operator of the mine is Denison Mines Ltd., P.O. Box 11575, 650 West Georgia Street, Vancouver, B.C., V6B 4N7.

The Gates Formation and the Gething Formation both contain coal seams of mineable thickness on the Quintette property; however, the Gates Formation contains all the reserves. Underlying the Babcock Mountain area is an extensive area of gently dipping seams bounded by dipping limbs. Six seams are of mineable thickness and two pits have been delineated: the Babcock pit on the eastern slope of Babcock Mountain; and the Roman pit, located within a fairly simple chevron fold at the southern end of the Murray syncline. North of the Murray River, in the Wolverine area, two more pits have been delineated. The Mesa pit, which is located on Mast Ridge, is contained in a complex syncline overlying a large thrust fault. The Deputy pit is situated in a smaller syncline immediately to the southwest and is contiguous with the Mesa pit. The Mast syncline, an area of relatively minor faulting, is located further to the southwest of the Mesa pit and contains the Wolverine pit.

The Quintette Mine commenced production in 1983. This is a conventional truck and shovel operation for both waste removal and coal recovery. The mine produces metallurgical coal which is sold to a consortium of Japanese steel manufacturers under long-term contract.

Raw coal is transported from the Mesa/Wolverine pits to the process facilities via a 13.3 km overland conveyor and from the Shikano pit by bellydump trucks. The raw coal is delivered to three 8,000 tonne capacity raw coal silos. From the silos, the coal is transported by conveyor to the process facilities, where it is screened, washed and dried to meet contract specifications. Cleaned coal is conveyed for storage in three 12,500 tonne capacity clean coal silos or, when necessary, stockpiled prior to shipment.

Clean coal is transported to Ridley Terminals in unit trains of 100 ninety-tonne gondola cars, which are loaded continuously and automatically. After loading, the rail cars are sprayed with a latex emulsion to minimize dust loss during transportation. The trains then travel 129 km on an electrified branch line to Anzac, followed by 124 km from Anzac to Prince George, and an additional 740 km from Prince George to Ridley Terminals at Prince Rupert. At Ridley Terminals, the coal is stockpiled and loaded into ships for transport to Japan.

As part of its restructuring plans following the May 28, 1990 price arbitration ruling, Quintette Coal announced plans to cut 63 salaried positions and eight hourly positions. A further 60 hourly-paid workers

were to be laid off temporarily. Quintette appealed the arbitration ruling to the B.C. Court of Appeal.

B.C. Rail's spur line from the Northeast coal mines (Quintette and Bullmoose) to the CN Rail mainline to Ridley Island was shut down due to strike actions from September 4 to 19, 1990. The strike forced the temporary layoff of 80 Quintette workers on September 20. Despite layoffs, the total average number of workers at Quintette was 1,462 the largest number of workers for any mine in the Province.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.77-78.
_____. Mining in British Columbia, 1986-1987, pp.74-75.
_____. Coal in British Columbia, Paper 1986-3, p.21.
MI 93I/10,11, MI 93P/19,20.
Quintette Coal Ltd., Annual submission, 02-15,1991.

NON-OPERATING MINES/MINE CLOSURES:

There were no reported closures in 1990.

4.5.5. Inspection District #10

OPERATING METAL OR COAL MINES:

GIBRALTAR

Lat.52°30' Long.122°16' (93B/9W)

The property is located approximately 161 km south of Prince George, B.C., and 16 km east of McLeese Lake, B.C., on the west side of Granite Mountain by Granite Creek. Access is via a 16 km. paved road which connects to Highway 97 near the north end of McLeese Lake.

The operation is 68.1% owned by Placer Dome Inc., Gibraltar Mine Division, P.O. Box 49330, Bentall Postal Station, 1600-1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

The ore zone is a copper-rich porphyry deposit, occurring within a Triassic pluton of variable composition. The mine phase, which contains the ore zone, is a quartz diorite that has been altered and deformed. Mineralization took place during a complex history of deformation which involved the folding of mineralized foliations. Four orebodies are known: Gibraltar East, Gibraltar West, Granite Lake, and Pollyanna. Ore minerals are chalcopyrite and molybdenite; however, the Gibraltar East and Pollyanna pits have well-defined zones containing supergene chalcocite.

The Gibraltar property was discovered in 1927 and was known as the Hill property; the Polyanna was discovered in 1910 and known as the Rainbow Group. The Gibraltar and Pollyana properties were for the most part explored separately until 1969, at which time they received a combined exploration program. At year-end, proven and probable reserves were 180,400,000 tonnes grading 0.31% copper and 0.009% molybdenum.

The Gibraltar Mine is a large open-pit copper operation that first began production in 1972. It produces copper and molybdenum concentrates from open pit mining and a concentrator, and cathode copper by leaching low-grade stockpile material. Gibraltar's copper concentrate is sold to Asian smelters under annual contracts. The production of cathode copper was below the capacity of the plant, reflecting reduced leaching rates in the older waste dumps. During 1990, the mine increased its production of copper due to slightly higher ore grades and recoveries. The mine was forced to suspend operations for a few days in June due to extreme rainfall conditions. The rain created a risk that run-off water might overflow the mine's closed perimeter acid mine drainage system.

In 1990, it was decided to proceed with the purchase of new mining equipment, including a 34-yard shovel and six 240-tonne haul trucks. This equipment will reduce operating costs and provide mining

capacity needed to accommodate the long-term mining plan.

During 1990, the average number of workers employed at Gibraltar was 301.

References:
B.C. Ministry of Energy, Mines & Pet. Res. G.E.M., 1973, pp.299-318.
_____. Mining in British Columbia, Vol.1, 1975-1980, pp.3-4.
_____. Mining in British Columbia, 1981-1985, pp.3-4.
_____. Mining in British Columbia, 1986-1987, pp.45-46.
MI 93B-6, 7, 12, 13.
Placer Dome Inc., Annual Report, 1990.

NON-OPERATING MINES/MINE CLOSURES:

There were no reported closures during 1990.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Frasergold (Eureka Resources Inc.): The company conducted drilling and work on exploration adits on this gold property.

Mount Polley/Cariboo Bell (Imperial Metals, Corona Corp.): This copper gold project submitted an MDRP Stage I proposal in October, 1990. The proposal describes a 14-year operation at 13,700 tonnes per day, with an average of 162 employees. Review of the proposal is ongoing.

4.5.6. Inspection District #11

OPERATING METAL OR COAL MINES:

There were no major mines operating in the district in 1990.

NON-OPERATING MINES/MINE CLOSURES:

Mosquito Creek (53°03'N, 121°36'W): This underground gold mine, which was placed on a care and maintenance basis in 1987, remained inoperative in 1990.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Cariboo Gold Quartz Mine, Wells: Reclamation of old tailings; area capped with washed gravel.

Wingdam Mine: Drift from surface to gravels was started in November, 1990.

4.5.7. Inspection District #13

OPERATING METAL OR COAL MINES:

ENDAKO

Lat.54°02' Long.125°07' (93K/3E)

The open pit molybdenum mine is located ten km southwest of Endako, B.C., and 160 km west of Prince George, B.C., north of the east end of François Lake. Access is via paved road from Highway 16 just east of Endako.

The mine is owned by Placer Dome Inc., Endako Mines Division, P.O. Box 49330, Bentall Postal Station, 1600-1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

This is an irregular and elongated orebody in Endako quartz monzonite, part of the Topley intrusions of Jurassic age. There has been pervasive kaolinization of the Endako quartz monzonite, which is intruded by a variety of premineral dykes and by postmineral basalt dykes. Molybdenite, pyrite, magnetite, and chalcopyrite are closely associated with quartz in veins and fracture fillings. Ore minerals occur in major quartz-molybdenum veins 15 centimetres to one metre wide. At year-end, proven and probable reserves were estimated at 147,400,000 tons grading 0.083% Molybdenum.

This open pit molybdenum mine, which commenced production in 1965, uses truck and shovel methods. Endako markets molybdic oxide and, through secondary processing, manufactures Ultrapure, which has a wide variety of applications, including use as a lubricant additive.
In 1990, molybdenum production increased primarily as a result of higher tonnage milled. With all milling lines in operation, molybdenum production increased by 11%. In the mine, steps taken to improve productivity included the purchase of new drilling equipment and a new shovel scheduled for delivery in 1991.

During 1990, the total average number of workers was 217.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1975-1980, Vol.1, p.23.
_____. Mining in British Columbia, 1981-1985, p.16.
_____. Mining in British Columbia, 1986-1987, p.57-58.
C.I.M. Porphyry Deposits of the Canadian Cordillera, 1976, pp.444-454.
MI 93K-6.
Placer Dome Inc., Annual Report, 1990.

NON-OPERATING MINES/MINE CLOSURES:

No significant closures were reported during the year.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

During 1990, there were 155 mineral exploration projects of varying significance, and 35 small placer projects.

Mount Milligan (Placer Dome): Placer Dome has secured ownership of the Mt. Milligan property from Continental Gold. The company commenced a drilling and geotechnical program to evaluate the Southern Star deposit for possible initial open pit development. A feasibility study and ore reserve estimates will be completed during 1991. The permitting process has been initiated through the MDRP for a copper-gold operation lasting 15 years, and employing 350 persons.

Nation Lakes (Westmin Resources): Five Westmin properties in the Nation Lakes area provide Westmin with a large land position near the Mount Milligan porphyry-gold deposit currently under development. The Klawli property was drill tested in 1990, defining part of a large area of low grade porphyry copper-gold mineralization. Additional drilling is planned in 1991. This property, and a second property: the Witch, have been farmed out with Westmin retaining a 40% interest. Attractive targets have also been defined by the operator on the Witch.

4.5.8. Summary of Activities

The Northeast Mine Development Review Committee operates from the Prince George Office. During 1990, the chair was occupied by E.J. Hall, followed by S.E. Wuschke. Several large regional developments were reviewed during 1990.

Reclamation work at Boss Mountain, which closed in 1983, continued in 1990 and should be completed by the fall of 1991.

4.6. SMITHERS REGIONAL OFFICE

4.6.1. Office Address

2nd Floor - Courthouse Building, 3793 Alfred Avenue, Smithers, B.C., V0J 2N0.
Tel: (604) 847-7383 Fax: (604) 847-7603

4.6.2. Office Personnel

At year end, office personnel included:

D.W. Flynn	District Inspector and Resident Engineer/Office Administrator
B.H. Good	District Inspector and Resident Engineer
D.L. Porteous	Inspector of Mines
E.J. Hall	Inspector of Mines - Reclamation
E.C. Konschuh	Secretary
G. Baker	Office Assistant
E. Burchett	Office Assistant

4.6.3. Area of Responsibility

The Smithers Regional Office is responsible for Inspection Districts #1 and #2 (see Map 1), with D.W. Flynn the Inspector responsible for District #1 and B.H. Good responsible for District #2. The office administers the Branch's programs in the northwest quarter of the province, as well as the Queen Charlotte Islands.

4.6.4. Inspection District #1

OPERATING METAL OR COAL MINES:

GOLDEN BEAR

Lat.58°13' Long.132°17' (104K/01W)

This open pit and underground gold/silver property is located 140 km west of Dease Lake, B.C. and 290 km northwest of Stewart, B.C.

The operation is owned by North American Metals (B.C.) Inc., 1020-800 West Pender Street, Vancouver, B.C., V6C 2V6.

This is a replacement ore body. Gold occurs in silicified and breccia zones along a major fault between Permian limestones and upper Triassic andesites.

In 1988, the 140 km access road reached the site, and construction began on a permanent camp and plant foundations. In addition, the airstrip and roads on the property were upgraded and further drilling took place. The first gold bar was poured at Golden Bear in early February, 1990. Design capacity is 360 tonnes per day (tpd). Mine life is estimated at a minimum of 5.5 years, with reserves of 1.63 Mt at 11.0g/t Au.

During 1990, an average of 115 workers were employed at the Golden Bear Mine.

References: MI 104KO79

JOHNNY MOUNTAIN

Lat.56°38' Long.131°04' (104B/11E)

This underground gold/silver property is located 280 km north of Terrace, B.C., on the northwest slope of Johnny Mountain. Access is by air only.

The mine is owned by Skyline Gold Corporation (formerly Skyline Explorations Ltd.), 301-675 West Hastings Street, Vancouver, B.C., V6B 1N2.

Visible native gold is common and is the main economic mineral. Associated minerals include pyrite, chalcopyrite and some sphalerite and galena. Quartz and microcline are the main gangua components of the veins. Mineralization is localized in at least three significant vein systems which represent staged, high temperature deposition related to syenitic plutonism of early Lower Jurassic age.

Pre-production mine development began in 1987, when the construction of the mill and related surface structures was commenced. Since 1987, efforts concentrated on underground development and stope preparation. Production commenced in August, 1988, making this the first producer in the Iskut River region of B.C.

The operation produced gold dore bars and a copper concentrate containing gold and silver. The installation of additional grinding capacity early in 1990 was expected to enable the operation to increase gold output by 16% or 8,000 oz/year. Also, silver output was expected to increase 13% to 88,800 oz. and copper 10% to 824 tonnes annually. However, in the summer of 1990 the company announced plans to suspend operations at Johnny Mountain in the fall due to an inability to develop new economic reserves at prevailing gold prices. Production ceased in September 1990. Prior to closure, the mine employed an average of 56 workers.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1986-1987, p.53.
MI 104B-107

PREMIER GOLD

Lat. 56°38' Long. 130°02' (104B/1E)

This open pit gold mine is located approximately 15 km north of Stewart, British Columbia.

The mine is owned by Westmin Resources Ltd., Pioneer Metals Ltd., and Canacord Resources Ltd., and operated by Westmin Resources Ltd., Suite 904-1055 Dunsmuir Street, P.O. Box 49066, Vancouver, B.C. V7X 1C4. The mine address is P.O. Box 476, Stewart, B.C. V0T 1W0. Westmin's share of production started at 50.1% and ended 1990 at 60%.

The open-pit operation is comprised of the Silbak-Premier and Big Missouri properties which include the Premier, Dago, S1, Province and Martha Ellen deposits. The Silbak Premier, and to a lesser extent the Big Missouri properties, were the sites of previous underground operations that operated for many years during the period 1920-1960. Proven and possible reserves as of January 1, 1990 were 3,388,900 tonnes averaging 2.51 g/t gold and 67.73 g/t silver.

The Premier gold mine went into operation in 1989. During 1990, shortfalls in predicted ore reserves resulted in an increased stripping ratio and necessitated the mining of a portion of the Province Zone at Big Missouri to maintain a supply of ore to the mill. The processing plan performed well in 1990, routinely averaging 2,300 tpd since April 1990, versus a design capacity of 2,000 tpd. A review of the remaining reserves of the Premier pit is in progress while other sources of ore for the concentrator are being sought. The objective of exploration of the property is to define sufficient reserves in the Silbak Premier mine and elsewhere to develop one or more underground mines. These could provide higher grade ore to the

Premier mill to augment lower grade open pit ores. Preliminary mine planning has been undertaken on several of the zones. During 1990, 165 persons were employed at the mine.

References:
Westmin Resources Ltd., Annual Report, 1990.

SNIP MINE

Lat.56°40' Long.131°06' (104B/11E)

The Snip underground gold mine lies approximately 100 km northwest of Stewart, B.C., at the junction of Bronson Creek with the Iskut River.

Prime Resources Group Inc. (49.8% owned by Corona by April 1991) has a 40% interest in the mine, while Cominco Ltd., holds the remaining interest and acts as operator. Cominco Ltd., is located at 2600 - 200 Granville Street, Vancouver, B.C V6C 2R2. Corona Corporation is located at Suite 2500, 666 Burrard Street, Vancouver, B.C. V6C 2X8.

Construction of a 330 tons per day concentrator began in June 1990, and the underground mine produced its first gold in January 1991.

The mine is developed by two adits on the west face of Johnny Mountain, at the 600-foot and 1,000-foot levels, and by a haulage way, driven from the Iskut River flats to the 400-foot level. Ore is mined using shrinkage stoping, and conventional and mechanized cut-and-fill methods.

Production in 1991 is expected to be in the order of 80,000 ounces of gold and 49,000 ounces of silver. During the start-up phase approximately 20% of gold production is being recovered in the mill's gravity separation circuit. The remainder is contained in a sulphide flotation concentrate which is transported by hovercraft down the Iskut and Stikine Rivers to the port of Wrangell, Alaska, and then shipped to a smelter.

At January 1990, Snip's proven and probable mineable reserves were estimated after dilution to be 868,000 tons grading 0.85 ounces of gold per ton, sufficient for the mine to operate for about seven years at currently planned rates. The mine is being operated as a fly-in camp. At full production it will employ about 140 people.

References:
Corona Corporation, Annual Report, 1990.

MAJOR INDUSTRIAL MINERAL OR STRUCTURAL MATERIAL OPERATIONS:

CASSIAR MINE

Lat. 59°19' Long. 129°53' (104P/5W; 104P/5E)

The Cassiar underground asbestos mine is located on Mount McDame, approximately 4.8 km north of Cassiar, B.C. The plant site is nine km from Highway 37, roughly 120 km north of Dease Lake.

The property is owned and operated by the Cassiar Mining Corporation, which is a wholly-owned subsidiary of Princeton Mining Corporation, #2000-1055 West Hastings Street, Vancouver, B.C. V6E 3V3. The mine address is Bag 1000, Cassiar, B.C., V0C 1E0.

The orebody is in a sill-like mass of serpentinite, intrusive into Devonion-Mississipian sedimentary rocks. The orebody strikes north and dips 30°-40° to the east. Numerous veinlets of chrysotile asbestos occur in light to dark green serpentinite. Magnetite is fairly abundant, occurring in disseminated microscopic veinlets and larger aggregates. Other associated minerals include magnesite, brucite, and antigorite. On the hanging-wall, zones of zoisite-quartz-tremolite hornfels occur at the contact of serpentinite with

argilllites and contain local, irregular bodies of nephrite jade.

The Cassiar mine originally commenced production as an open-pit operation in 1953. 1990 was a transition year, as the mining of underground ore from the McDame deposit was phased in following the depletion of open pit ore stockpiles. Mining of the remaining recoverable ore from the pit was completed by May, 1990. All recoverable ore was delivered to the concentrator area by mid-July, at which time the tramline was shut down for relocation to the McDame portal elevation in preparation for underground ore.

The underground mining method selected was sub-level block caving, which is ideally suited for massive highly-fractured deposits. The method requires heavily supported drawpoints which are driven at regular intervals into the orebody footwall. The drawpoints are then undercut to initiate the cave process after which the ore flows by gravity. Rubber tired load-haul-dump machines deliver the ore to a centrally located crusher and orepass. The crushed material is conveyed to the transfer tower where it is trammed to the concentrator. The fibre is packaged, transported by road to the dock at Stewart, B.C., then barged to Vancouver, B.C. Sales are made to customers in 45 countries around the world.

Underground ore from the McDame deposit was brought on stream in November, 1990. The initial ore contained oversize boulders which impeded delivery of ore through the delivery system. However, early in 1991, installation of a mineral sizer rectified this problem and continuous fibre production in excess of 300 tonnes per day was achieved. The company believes that 30,000 tonnes of fibre production is a realistic annual production goal. Underground ore reserves which are presently being re-evaluated are reported by the company to be estimated at 18,900,000 tonnes at 6.1% recoverable fibre. At the current rate of production, this is believed to be sufficient for a fifteen year mine life. The operation employed an average of 344 people during 1990.

References:
B.C. Ministry of Energy, Mines & Pet.Res., Mining in British Columbia, 1975-1980, Vol.1,p.41.
_____. Mining in British Columbia, 1981-1985, p.52.
_____, Mining in British Columbia, 1986-1987, p.78.
MI 104P-5; 104P-084.
Princeton Mining Corporation, Annual Report, 1990.
Princeton Mining Corporation, First Quarter Report, 1991.

NON-OPERATING MINES/MINE CLOSURES:

Erickson Gold, owned by Total Energold Corp., has been closed until further ore reserves are outlined for a minimum of two years. During 1990, exploration and reclamation work took place on the surface of the property.

Johnny Mountain, owned by Skyline Gold Corporation, closed in September, 1990, due to a lack of economically viable reserves.

Taurus Mine, owned by International Taurus Resources Ltd., remained shut down.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Anyox (55°27'N, 129°47'W): Tru-Grit Abrasives began removing slag from the old Anyox site.

Eskay Creek (56°38'N, 130°28'W): Prime Resources, Corona Corp., and Stikine Resources have filed an MDRP prospectus for a potential gold mine producing 750 - 1,500 stpd and employing 200 to 250 persons. By the end of 1990, an access ramp and crosscuts through the main contact lens had been advanced a total of 4,400 ft., and engineering studies for a 60 km road to the property completed. A mine feasibility study is expected by mid-1992, after which application will be made for Stage I MDRP. Pending approval, planned construction of the access road will begin in the summer of 1991 and is

expected to be completed by late 1992. Site preparation could begin in the spring of 1993, and plant construction could follow in 1994 with start-up forecast for late 1994 or early 1995.

Inel (56°36'N, 130°57'W): Underground exploration and drilling programs at Gulf International's project on Upper Bronson Creek were completed in October, 1990.

Sulphurets (58°28'N, 130°11'W) Newhawk Gold Mines (60%)/Granduc Mines Ltd., (40%): This potential gold mine, is located approximately 50 km northwest of Stewart. Since 1985, the joint venture has spent over $30 million in exploration, mostly on the surface and underground exploration of the West Zone, which continued in 1990.

Windy Craggy (39°44'N, 137°44'W): Geddes Resources Ltd., is continuing with exploration on its copper-gold Windy Craggy property, located in the extreme northwest of the province at the southern end of the St.Elias Mountains near the Yukon and Alaska Borders. Present access to the property is by aircraft generally flying out of Whitehorse, 190 km to the southwest. A Stage I MDRP report filed in January was revised and resubmitted by November. The proposed mine would produce 25,000 tonnes per day for over thirty years, and employing approximately 600 persons. Review of the project is ongoing.

4.6.5. Inspection District #2

OPERATING METAL AND COAL MINES:

BELL COPPER

Lat.55°00' Long.126°12' (93M/1E;93L/16)

The Bell open pit copper/gold property is located at the north end of the Newman Peninsula on Babine Lake, approximately 70 km northeast of Smithers, B.C., and 16 km north of Granisle, B.C.

The mine is owned by Noranda Inc., P.O. Box 45, Commerce Court West, Toronto, Ontario, M5L 1B6.

The Bell orebody is an elliptical intrusion of biotite feldspar porphyry, 730 by 365 metres in size. Copper mineralization occurs overlapping the western and northern contacts of the stock, giving the deposit a crescent shape. The sediments and volcanics are generally hornfelsed, and all units have undergone intense hydrothermal alteration. The mineralization is primarily chalcopyrite which occurs in a dense quartz stockwork as disseminations and fracture fillings. Pyrite forms from eight to fifteen per cent of the rock in the ore zone. Also, a zone of supergene enrichment exists, with chalcocite common as much as 60 metres below the surface. Assorted copper oxides and carbonates make up five to ten per cent of the total copper content of the upper part of the deposit. Minor amounts of gold and silver are associated with the chalcopyrite.

The Bell Copper operation commenced production in 1972. 1990 year-end reserve inventory was 6,436,000 tonnes grading 0.61% copper and 0.01 oz/mt gold. Total average number of employees at the Bell mine during 1990 was 303.

References:
B.C. Minister of Mines. Annual Report 1965, pp.99-102.
B.C. Ministry of Energy, Mines & Pet. Res. G.E.M.: 1969, p.114.; 1970, p.170; 1971, pp.185-186; 1972, pp.426-428; 1973, pp.352-353; 1974, p.266.
_____. Mining in British Columbia, 1975-1980, Vol.1, pp.21-22.
_____. Mining in British Columbia, 1981-1985, p.15.
_____. Mining in British Columbia, 1986-1987, p.56-57.
MI 93M-1.
Noranda Ltd., Annual Report, 1990.

EQUITY SILVER

Lat.54°11' Long.126°16' (93L/1W)

The Equity open pit copper, gold, silver property is located 40 km southeast of Houston, B.C., and approximately 15 km north of François Lake.

The operation is 58.8% owned by Placer Dome Inc., P.O. Box 49330, Bentall Postal Station, 1600-1055 Dunsmuir Street, Vancouver, B.C., V7X 1P1.

The ore zone is within a west-dipping dacitic volcanic pile of Mesozoic age. The Mesozoic rocks are intruded on the east by a Tertiary syenomonzonite stock. The base of the mine section is quartz pebble conglomerate, above which is a layer of dacite pyroclastic breccia. Silver-copper mineralization, in the form of tetrahedrite and chalcopyrite, occurs in 5-100 metre wide shear and breccia zones, within host alphanitic, brittle tuffaceous rock. Accessory sulphides associated with the ore-bearing minerals are pyrite, galena, sphalerite and arsenopyrite. Proven and probable reserves at year-end were 6,500,000 tons, grading 2.10 oz/ton silver, 0.22% copper, and 0.024 oz/ton gold.

Equity Silver Mine went into operation in 1980 using conventional open-pit methods. In 1990, silver production improved by 5% over 1989, reflecting higher grade ores and improved recoveries which also impacted favourably on gold production. The mine markets a silver-gold-copper concentrate to a Japanese smelter under a long-term contract effective for the remaining mine life. Bullion from a secondary recovery process is shipped to a refinery in eastern Canada. In 1991, production of silver, gold and copper is expected to drop significantly as a high proportion of ore processed will come from lower grade sources and stockpiled ore as the mine moves towards depletion and closure of operations in the fourth quarter of 1992.

The total average number of employees at Equity Silver during 1990 was 205.

References:

B.C. Ministry of Energy, Mines & Pet. Res. G.E.M.: 1969, p.150; 1970, p.126; 1971, p.168.
_____. Mining in British Columbia, 1975-1980, Vol.1, pp.24-25.
_____. Mining in British Columbia, 1981-1985, p.16.
_____. Mining in British Columbia, 1986-1987, p.58-59.
MI 93L-1.
Placer Dome Inc., Annual Report, 1990.

LAWYERS

Lat.57°20' Long.127°12' (94E/6)

This underground silver and gold mine is located approximately 280 km north of Smithers, B.C., in the Toodoggone River area. Access is via the Omineca Mining Access Road which extends northwest from Moosedale to the mine site.

The operation is owned by Cheni Gold Mines Inc., Box 11175, Royal Centre, 1055 West Georgia Street, Vancouver, B.C., V6E 3R5.

The eastern part of the property is underlain by quartz-andesite-crystal-lapilli-tuff which represents the remnant of a paleo-horst. The western part is underlain by volcano-sedimentary rocks of trachytic source, which represent a graben basin. Several gold-silver showings have been located, all associated with silicified filling of reactivated faults and fractures along the paleo-graben margins. The three main ore zones (the Amethyst Gold Breccia Zone, the Cliff Creek Breccia Zone, and the Duke's Ridge Zone) are all within, or near, the area of trachyte volcanism deposited west of the paleo-horst.

The mine commenced commercial production on March 1, 1989. Operating costs per ton milled

decreased by 8% from 1989 to 1990 as a result of increased mill throughput. The company reports this increase in mill capacity was effected without modifications to the plant and without a detrimental effect to recoveries. At year-end, total mineable reserves were estimated to be 789,593 tons grading 0.223 ounces per ton gold and 6.16 ounces per ton silver.

Underground development and drilling on 15 metre centres in the Cliff Creek North stope development panel has intersected a strongly-developed multi-phase breccia system which is being studied in detail. At present, the company anticipates a mine life of four years, with potential for delineating an additional year's reserves from the ongoing underground exploration program.

Total average number of employees at the Lawyers Mine during 1990 was 145.

References:
B.C. Ministry of Energy, Mines & Pet. Res. Mining in British Columbia, 1981-1985, pp.17-18.
_____. Mining in British Columbia, 1986-1987, p.59-60.
MI 94E-66.
Cheni Gold Mines Inc., Annual Report, 1990.

SHASTA MINE

Lat. 57°17' Long. 127°00' (94E/7)

The Shasta open pit and underground gold/silver mine is in the Toodoggone area.

The property is owned by International Shasta Resources Ltd., 1110, 625 Howe Street, Vancouver, B.C. V6C 2T6. The mill is owned by Sable Resources Ltd., of the same address.

International Shasta submitted an MDRP prospectus in July 1989, which received approval-in-principle by November of that year. In the spring of 1990, the company went into production, trucking an average of 153 tpd to the old Baker mill owned by Sable Resources Ltd. Sable Resources reactivated and expanded the Baker concentrating facilities. The Shasta operation is expected to have a mine life of two to three years.

During 1990, Shasta operations employed an average of 28 workers.

NON-OPERATING MINES/MINE CLOSURES:

A closure plan was submitted for Noranda's Granisle Mine, and reclamation continued at the site.

MAJOR EXPLORATION/DEVELOPMENT PROJECTS:

Al Claims: Early in 1990, Cheni Gold Mines purchased the Al claims from Energex Minerals Ltd. Cheni is planning to build a 35-km haulroad to its existing mill and also to continue exploration on the property.

Cirque lead, zinc, silver property of Curragh Resources Inc.: Underground drilling and exploration took place during 1990. Stage I MDRP submission expected for early 1991 for 3,500 mtpd for 16+ years, employing 250 persons.

Cinola property is located 18 km south of Port Clements, B.C., on Graham Island in the Queen Charlotte Islands and owned by City Resources (Canada) Ltd. Following completion of a feasibility study, a Stage II Environmental Report was submitted in July 1988. The proposed open-pit operation would have an average throughput of approximately 6000 tonnes/day, for a project life of 12 years. In 1990, the company announced that further development of Cinola was postponed for economic reasons. Accordingly, planned public hearings into the project were not conducted.

Dome Mountain: The Dome Mountain gold/silver project of Teeshin Resources was granted approval in 1988; however, financing and ownership questions are still being resolved. Drilling has continued on the property to increase ore reserves. No application for mine construction has been received; however, the possibility of milling the ore by other existing operations was being investigated.

Mount Klappan: Gulf Canada Resources submitted a Stage II Report for this anthracite project in 1987. Review comments have not been finalized. No activity was reported on the site in 1991.

Silver Queen (Pacific Houston Resources): During 1989 major underground exploration and drilling programs were conducted at this past producer; however, a preliminary feasibility study did not support further development work during 1990.

Silbak Premier and Indian/Snowfield gold properties of Westmin Resources Ltd., are adjacent to Westmin's Premier Gold Mine. During 1990, Westmin conducted extensive exploration and diamond drilling on these properties.

Sukunka: The Canadian Coal Co. Inc., submitted an MDRP prospectus in May 1990 for an underground 2.2M mtpy metallurgical coal operation for 20 years, employing approximately 240. Review of the prospectus is on hold.

Telkwa: The Telkwa thermal coal project of Crows Nest Resources Ltd., (a subsidiary of Shell Canada Ltd.) was granted approval-in-principle in 1986, but construction has not commenced due to poor market conditions. Exploration programs on the north side of the Telkwa River have indicated significant coal reserves. Early in 1990 the company submitted a revised project plan for MDRP review. Government review has identified additional concerns to be addressed by the company. Late in the year, Shell decided to sell its coal interests and the company has been reviewing proposals to that end. If the project proceeds, it could employ approximately 185 people for a period of 15 to 20 years. Approval-in-principle has not yet been given to the revised project plan.

4.6.6. Summary of Activities

The Northwest Mine Development Review Committee operates out of the Smithers office. In 1990, B.H. Good was Chairman. The following were prominent in the Committee's work during the year:

- Westmin Resources submitted reports on waste handling and reclamation of the Province Zone which had been excluded from the AIP granted to the Premier Gold project. Work was approved and a limited amount of ore produced from the Province Zone in addition to the Premier pit operation.

- Westmin Resources submitted a proposal on proposed underground mining at the Tenajon property.

In the area of safety and investigations, District Inspectors were involved in the following:

- Investigation of fatalities at Cheni Mines and Cassiar, McDame.

In addition, the Branch continued to participate in the Equity Mine Surveillance Committee review of the closure plan for the Equity Mine.

4.7. INFORMATION SYSTEMS

During the year two major information management systems were developed in the Branch to enhance service to industry and the public.

One system is designed to give District Inspectors in the regional offices immediate access to permitting information contained in Notices of Work for mineral, placer, and sand and gravel operations. This system also allows more streamlined management of the approval process by standardization of the processing of permits in regional offices.

The second system relates to accident reporting. Trial installations of the Mine Accident Reporting System (MINACC) at two mines on Vancouver Island are providing the participating mines with the opportunity to contribute to the overall design and development of the system. MINACC is an easy to use data entry and reporting system for mine accidents and dangerous occurrences, which will run on IBM compatible personal computers. Data from MINACC will be transmitted to the provincial database in Victoria and also the National Mine Accident Database at Canada Energy, Mines and Resources in Ottawa which contributes to accident prevention strategies throughout the mining industry. It is anticipated that when MINACC is fully developed, by mid-1991, the system will be available for use by all mines in British Columbia.

PART 5: HEALTH AND SAFETY STANDARDS AND SPECIAL PROJECTS

5.1. ENVIRONMENTAL CONTROL

Role and Responsibilities
The Environmental Control Section is charged with monitoring the workplace environment at metal mines, coal mines, and industrial mineral mines and quarries throughout the province. It ensures compliance with the Health, Safety and Reclamation Code for Mines in British Columbia with regard to the chemical, physical and radiated elements to which workers are exposed.

With the use of computer-aided systems, the audiologist keeps track of any occupational hearing loss of approximately 15,000 persons working in B.C.'s mining industry. Mandatory annual tests are carried out on persons working in perceived high-noise areas. Environmental Inspectors monitor factors such as underground mine ventilation, gases, dust, noise, lighting and radiation. The section is also responsible for training, examining and certifying audiometric technicians for the mining industry.

Structure and Organization
In 1990, the work of the section was carried out by four persons including the Section Head and three Environmental Inspectors, one of whom is the audiologist. On September 21, 1990, the audiologist resigned.

Summary of Activities
During 1990, Environmental Inspectors made 46 detailed inspections which involved 32 different mining companies.

In cooperation with Westmin Resources Ltd., the section also participated in a field study into the effectiveness of ceramic filters as a method of controlling emissions from diesel engines operating in underground environments. When used in conjunction with fuel additives, these filters aid in controlling carcinogenic respirable and combustible dusts produced during engine operation.

In conjunction with the U.S. Bureau of Mines and Simon Fraser University, the section was also involved in an extended hours of work study at the Myra Falls operations of Westmin Resources Ltd. Phase I of this study took place May 14 - 23, 1990. The program consisted of volunteers from the mine who were previously working eight-hour shifts but who switched to twelve-hour shifts.

The following table provides details of the audiometric programs conducted during 1990:

Audiometric Programs, 1990

Audiometric Technicians:	**Number**
Trained	0
Certificates Renewed	2
Sound Surveys:	**Number**
Conducted	1
Operations Surveyed	1
Sound Survey Results:	**Percentage**
Workers wearing ear protection where required	90[1]
Drill mufflers in use	100
Properties performing audiometric tests on workers	100[2]

[1] Approximate

[2] With the exception of a few small gravel pits.

5.2. MECHANICAL ENGINEERING

Role and Responsibilities
The Mechanical Section ensures that all mechanical equipment installed and used at mines complies with the Mines Act and applicable Codes and Standards, and that the equipment is maintained in acceptable condition such that its operation would cause no hazard to persons or property.

Structure and Organization
The Section consists of one professional mechanical engineer (Head, Mechanical-Electrical Engineering) and two mechanical technicians (Mechanical Inspectors in Fernie and Kamloops).

Summary of Activities
1990 saw evidence of a shift towards higher capacity haul trucks at surface mines. Newer model trucks incorporate many of the design features developed over the years, and as a result, the vehicles tend to be more efficient in both productivity and safety-related systems. Braking systems continue to be highly reliable and cab environments are far more conducive to fatigue relief and ease of control for the operator.

A good deal of research was undertaken into particulate emissions from diesel engines operating in enclosed environments, i.e. underground mines. Respirable combustible dusts emitted as a consequence of engine operation and from background sources such as drill-oil mist, are especially harmful to persons working underground. With the cooperation of one of the larger underground mines, extensive testing was carried out on a platinum catalyzed ceramic filter capable of removing some 90 percent of the respirable combustible dust produced by the diesel engine. Not only did the filter prove its removal capabilities, but it was also able to regenerate its capture capabilities by "burning off" the trapped dust without creating harmful engine back-pressures.

The section also undertook other research work into an obstacle-detection system, and a system for continuous tire-pressure monitoring, in cooperation with private research and development companies.

A **Materials Handling, Mining and Processing Steering Committee** was formed in 1990 to identify projects to enhance the efficiency and safety of materials handling, mining and mineral processing at mines. One of the committee's main goals is to identify research projects worthy of funding. Another prime function includes the transfer of information throughout the mining industry, with the idea of providing an "early warning" system to the mines in order that new technologies, or contemplated changes in codes and standards may be investigated promptly and efficiently and the results disseminated.

British Columbia mines are predominantly surface operations, with ore grades which are generally low, and which present complex metallurgical problems. Many of the remaining coal seams are relatively thin, thus requiring huge tonnages of materials: ore, coal and waste rock, to be moved daily. Through the normal methods of drilling, blasting, loading, and hauling, equipment can move approximately a quarter of a million tonnes of material a day at a single operation. Much of this material has to be crushed, ground separated, and dried on a daily basis. In addition, the protection of people and the surrounding environment remains a prime consideration, not only in daily operations, but when planning for future development at the mines.

Underground mines also present unique challenges. The nature of ore bodies and the competence of surrounding rock frequently requires innovative work methods. The need to provide adequate clean air in environments operating with diesel engines has led to the development and testing of a variety of pollution control mechanisms, some of which may be the forerunners for similar devices to be fitted to exhaust systems of diesel engines operating on regular highways.

The Materials Handling, Mining and Processing Steering Committee is chaired by the section head of the Mechanical Engineering and Materials Handling, and is comprised of representatives from other branches of MEMPR, The Mining Association of British Columbia, CANMET, and provincial mining companies.

Synopsis of Major Mechanical Equipment in Use at Mines in British Columbia during 1990

SURFACE EQUIPMENT

Haulage Trucks

Type of Operation	Capacity (Tonnes)								Total
	0–19	20–39	40–74	75–99	100–149	150–174	175–199	200+	
Coal Mine	0	6	15	18	91	147	16	4	297
Metal Mine	19	39	21	34	58	85	3	0	259
Others	109	84	18	7	0	0	0	0	218
Total	128	129	54	59	149	232	19	4	774

Front-End Loaders

Type of Operation	Bucket Size (m3)								Total
	0–1.9	2–3.9	4–5.9	6–8.9	9–11.9	12–14.9	15–19.9	20+	
Coal Mine	1	9	29	2	21	7	0	0	69
Metal Mine	23	28	8	8	5	0	0	1	73
Others	25	115	61	20	11	0	1	0	233
Total	49	152	98	30	37	7	1	1	375

Shovels

Type of Operation	Shovel Size (m3)									Total
	0–1.9	2–3.9	4–5.9	6–7.9	8–9.9	10–11.9	12–14.9	15–19.9	20+	
Coal Mine	0	2	6	0	3	3	28	7	15	64
Metal Mine	2	2	5	9	15	16	0	6	2	57
Others	12	7	4	0	0	0	0	1	0	24
Total	14	11	15	9	18	19	28	14	17	145

Rotary Drills:

Type of Operation	Drill Diameter (mm)						Total
	0–79	80–159	160–204	205–254	255–299	300+	
Coal Mine	1	2	0	6	3	20	32
Metal Mine	4	2	7	14	7	8	42
Other	21	5	3	1	1	0	31
Total	26	9	10	21	11	28	105

Mobile Cranes:

Type of Operation	Lifting Capacity (tonnes)									Total
	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80+	
Coal Mine	0	3	3	3	2	0	0	3	4	18
Metal Mine	4	12	7	5	6	1	1	1	3	40
Others	1	1	3	0	0	0	0	0	0	5
Total	5	16	13	8	8	1	1	4	7	63

Other Equipment over 5,000 kg Mass:

Type of Operation	Dozers	Graders	Scrapers	Other**	Total
Coal Mines	95	33	4	73	205
Metal Mines	78	45	0	89	212
Others	68	25	11	77	181
Totals	241	103	15	239	598

** Service vehicles, backhoes, sand and water trucks, compactors, lift trucks, portable compressors, generators, screening plants, draglines, etc.

UNDERGROUND EQUIPMENT

Diesel Powered	Number
Load-Haul-Dump	64
Front-end Loaders	17
Haul Trucks	22
Locomotives	3
Drill Jumbos	41
Graders	6
Dozers	1
Other	129
Total	289

Hoists in Use	Number
Sullivan	2
Parson Bante	1
Westmin (Myra Falls)	4
Bralorne	1
Total	8

5.3. ELECTRICAL ENGINEERING

Role and Responsibilities
The Electrical Engineering Section is responsible for the approval and inspection of electrical installations at mines. Electrical equipment is inspected to ensure compliance with the Mines Act and the applicable Canadian Standards, and to ensure that all electrical equipment is operated in a safe manner.

Structure and Organization
The Section is staffed by one electrical engineer based in Victoria.

Summary of Activities
The section was without an electrical engineer for some six months of 1990, and much of the electrical engineering work had to remain in abeyance with the rest of the section staff performing cursory electrical inspections.

Electrical Statistics, 1990

Metalliferous Mines

Reported power generated at company owned generating plants: ..... 93 225 250 kWH

Reported power purchased from public utilities: ..... 2 269 253 528 kWH

Total power consumption ..... 2 722 478 778 kWH

The following table provides an analysis of connected load at operating metalliferous mines.

Connected Load at Metal Mines, 1990

Equipment	Rated Power (kW)
Trams and Hoists	1 492
Scraper Hoists	5 069
Electric Shovels	32 893
Electric Drills	7 698
Fans	11 861
Pumps	8 361
Rectifiers	4 261
M.G. Sets	1 196
Air Compressors	16 431
Sink and Float	3 320
Crushing	19 992
Grinding	229 731
Concentrating	37 538
Magnetic Separation	44
Conveyors	37 777
Mill Pumps	37 284
Fresh Water Pumps	34 521
Workshops	11 942
Miscellaneous	31 196
Total	532 607

Coal Mines

Reported power purchased from public utilities: ..... 682 914 617 kWH

The following table provides an analysis of connected load at operating coal mines.

Connected Load at Coal Mines, 1990

Equipment	Rated Power (kW)
Draglines	0
Ventilation and Drying	3 230
Electric Shovels	48 461
Electric Drills	14 983
Conveyors	11 514
Hoisting	166
Haulage	56
Coal Breaker	1 434
Washing and Screening	45 071
Pumping	25 002
Air Compressors	3 980
Miscellaneous	22 021
Total	175 918

Industrial and Structural Minerals

Reported power generated at company owned generating plants ..... 52 556 896 kWH*

* Includes power generated by Cassiar Mine.

Reported power purchased from public utilities ..... 32 579 251 kWH

Total power consumption ..... 85 136 147 kWH

All Operations

The following table provides a summary of power consumption at all types of operations since 1975.

Actual Consumption of Power (million kilowatt hours)

Year	Metal Mines	Industrial Minerals	Coal Mines	Total
1975	2 092.1	66.8	363.3	2 522.2
1976	2 125.7	80.9	211.2	2 417.8
1977	2 212.1	78.7	312.0	2 602.8
1978	2 057.9	67.9	289.2	2 415.1
1979	2 257.9	88.8	299.8	2 646.0
1980	2 359.3	95.1	277.9	2 732.3
1981	2 761.6	65.3	319.6	3 146.5
1982	2 605.5	77.5	330.4	3 013.4
1983	2 434.1	76.9	356.6	2 867.6
1984	1 975.0	91.2	578.4	2 644.6
1985	2 255.3	69.8	634.9	2 960.0
1986	2 338.4	51.1	581.8	2 971.3
1987	2 673.1	67.5	612.3	3 352.9
1988	2 871.7	75.2	667.7	3 614.6
1989	2 637.7	84.0	657.4	3 379.1
1990	2 774.5	83.7	682.9	3 541.1

5.4. MINE RESCUE, SAFETY AND FIRST AID

Role and Responsibilities

Key functions of the Branch are to promote mine rescue, safety and first aid, and to provide assistance to the mining industry in these areas. This is done through training and certification; the provision of relevant publications; and the maintenance of mine rescue stations and equipment.

Structure and Organization

Regional mine rescue stations are located in Fernie, Nanaimo, Kamloops, Smithers, Prince George and Nelson. The stations are under the supervision of the Regional Office Administrator/Resident Engineer in each region and the Mine Emergency Preparedness Co-ordinator in Victoria.

Summary of Activities

Training

Due to the reduction in mine rescue staff following restructuring of the Branch, training in mine rescue is now being conducted by the mining industry and/or other private agencies. Arrangements are underway to establish training programs at Cariboo College in Kamloops, and at the British Columbia Institute of Technology in Burnaby.

To assist mine management in the transition to providing qualified mine rescue instructors, a mine rescue upgrading course was prepared by Branch Staff. Courses were held in Nanaimo, Sparwood and Kamloops, and will be held twice per year at various locations throughout the province.

In 1990, a total of 17 instructors were certified or recertified, three for underground mine rescue, and 14 for open pit mine rescue.

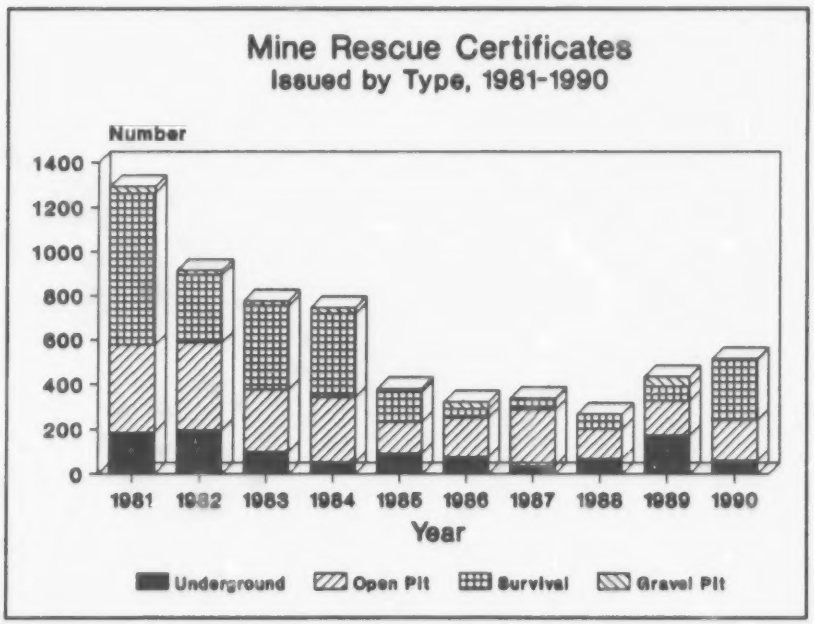
The examination of candidates and the issuance of certificates of proficiency in mine rescue work are still the responsibilities of the Branch. Examination and certification is conducted by designated staff in Victoria, Prince George, Kamloops and Fernie.

Mine Rescue Certificates, 1990

Type of Certificate	Number Issued
Survival mine rescue	268
Survival mine rescue instructor	0
Underground mine rescue	61
Underground mine rescue instructor	3
Surface (open pit) mine rescue	179
Surface (open pit) mine rescue instructor	14
Gravel pit rescue	7
Advanced mine rescue seals	80
Total Certificates Issued	612

Mine Rescue Certificates, 1981-1990

Year	Underground	Surface	Survival	Gravel Pit	Total
1981	187	390	685	31	1,293
1982	198	390	308	21	917
1983	99	277	379	22	777
1984	52	290	376	28	746
1985	92	142	133	13	380
1986	76	175	40	30	321
1987	36	252	45	5	338
1988	69	134	65	0	268
1989	173	154	62	45	434
1990	61	179	268	7	515
Total	1,043	2,383	2,361	202	5,989



Emergency and standard first aid statistics will no longer be published in this report since the training is now conducted by first aid training agencies or associations.

Publications

The Mine Rescue Training Manual was revised in 1990. The Underground and Surface Mine Rescue manuscripts have been amalgamated into one general manual, and the Survival and Gravel Pit mine rescue course modules have been included. In addition, the section on fire fighting has been improved and a section on rescue rigging added. The new manual is available from Crown Publications Inc., in Victoria, B.C.

Mine Rescue Stations and Equipment

It has been decided that regional mine rescue stations located in Nanaimo, Nelson and Prince George will be closed. Mine rescue equipment in Nanaimo is to be relocated to a hangar at Victoria airport. The Kamloops station will relocate to the British Columbia Buildings Corporation building on Columbia Street, Kamloops. Mine rescue equipment from Nelson and Prince George will be transefrred to stations at Smithers, Fernie, Kamloops and Victoria airport.

A protocol agreement has been established between the Ministry of Energy, Mines and Petroleum Resources and the provincial Air Services Branch to provide air transport requirements for men and equipment in the event of a major underground or surface disaster within the province.

Underground mine rescue equipment owned by the Ministry of Energy, Mines and Petroleum Resources (MEMPR) and by industry in 1990 is shown in the following table.

Underground Mine Rescue Equipment, 1990

Item	MEMPR	Industry	Total
Draeger BG 174 breathing apparatus	43	68	111
Aerolox breathing apparatus	59	18	77
Liquid oxygen flasks	21	5	26
Thermal cameras	1	1	2
Chemox breathing apparatus	37	8	45
Draeger Oxy SR 30 & 45 B.A.	41	28	69
Draeger Oxy SR 60 B.A.	0	2	2
Pressure Demand B.A.	20	30	50
Type 'N' gas masks	54	73	127
H.E. foam generators	0	6	6
Oxygen pumps	9	1	10
Draeger RZ 25 testers	5	6	11
Draeger RZ 35/40 testers	5	5	10

Other Programs

Work on a Mine Rescue Preparedness and Response Program was initiated by the Branch and has been ongoing. The program is to include other ministries and resource agencies, as well as the mining industry, and will work in conjunction with existing underground and surface emergency response teams. An evaluation of existing evacuation plans at underground mines is in progress.

Five mine safety associations, sponsored by the Ministry of Energy, Mines and Petroleum Resources and the Workers' Compensation Board, continued to operate in different areas of the province. These associations are:

1. The Vancouver Island Mine and Industrial Safety Association;
2. The East Kootenay Mine and Industrial Safety Association;
3. The West Kootenay Mine and Industrial Safety Association;
4. The South Central B.C. Mine Safety Association; and
5. The North B.C. Mine Safety Association.

These associations consist of representatives from industry, the Engineering and Inspection Branch, the Workers' Compensation Board and St. John's Ambulance. Each association promotes mine rescue training, first aid training and safety education in its district.

5.5. COMPETITIONS

Interest in mine safety and rescue work is stimulated by the various competitions held annualy between mines in the province and across the country. Because of this, the Engineering and Inspecton Branch is actively involved.

Competitions are in five categories:

1. Mine Rescue - Underground and Surface.
2. Underground Bench Competition.
3. Safety Competitions based on annual accident frequency for: A. Small Mines and B. Open Pit Mines and Quarries.
4. First-aid Competitions.
5. John T. Ryan Trophies, open to all Canadian mines, with one division for metal mines and one for coal mines. These trophies, which are awarded annually on both a regional and Canada-wide basis, are based on accident frequency results.

5.5.1. Mine Rescue Competitions

The Provincial Mine Rescue Competitions were held in Nanaimo on June 16, 1990.

Underground
Underground rescue teams compete directly in the Provincial Competition. In 1990, the winner of the Provincial Underground Mine Rescue Competition was Cominco Ltd., Sullivan Mine. There was no Canadian Championship.

Surface
District surface mine rescue competitions were held by the following safety associations in 1990: East Kootenay, South/Central and North. Both the first and second place teams went on to compete in the Provincial Championship. The district winners were as follows:

East Kootenay Mine and Industrial Safety Association:
- Westar Mining Ltd., Greenhills Operation
- Crows Nest Resources Ltd., Line Creek Mine

South/Central B.C. Mine Safety Association:
- Highland Valley Copper Corp., Highland Valley Mine
- Teck Corp., Afton Mine

North B.C. Mine Safety Association:
- Gibraltar Mines Ltd., Gibraltar Mine
- Westmin Resources Ltd., Premier Gold Mine

The Provincial Surface Mine Rescue Competition was won by Highland Valley Copper Corporation.

There was no Canadian surface rescue competition.

5.5.2. Underground Bench Competition

The Provincial Underground Bench Competition was instituted in 1978. Competing teams must demonstrate their proficiency in the examination and testing of their apparatus prior to use. The event is in memory of the late B. Abbott, captain of the Cominco Ltd. H.B. mine rescue team in 1976 which won the Canadian Underground Mine Rescue Competition that year.

In 1990, this competition was won by Cominco Ltd., Sullivan Mine.

5.5.3. Safety Competitions

Small Mines

The West Kootenay Mine and Industrial Safety Association Trophy for Small Mines was donated in 1951 to encourage and promote safety in small mines. Since 1956, the competition has been open to qualifying mines throughout the province.

The award is given to the metal mine that has the lowest compensable accident rate after working from 2,500 to 30,000 shifts per year, at least one third of which were underground. The mine must have operated for at least nine months during the calender year. A fatality automatically disqualifies a mine for that year.

In 1990, the award was won for the third consecutive year by the Parson Barite Mine, situated 35 km south of Golden. The mine's safety record was one lost-time accident, resulting in five lost work days. The award was presented at a banquet in Nelson's Heritage Hotel to Bill Boreham, Mine Superintendent. The Parson Mine competed with five small underground mines to win the trophy. Parson's award ties the record set by the Violac Mine in 1954. This is Parson's fourth win, having been awarded the trophy for the first time in 1985.

Open Pit Mines and Quarries

Trophies are awarded by the Ministry of Energy Mines and Petroleum Resources to those operations having the lowest compensable injury frequency rate.

1. The "A" trophy goes to operations having from 35,000 to 200,000 man-hours per year.

2. The "B" trophy goes to operations having from 200,000 to 1,000,000 man-hours in the year.

3. The "C" trophy, introduced in 1987, goes to operations that worked a minimum of 1,000,000 man-hours during the year.

4. Certificates of Achievement are awarded to operations amassing 15,000 man-hours without accidents over a continuous period not previously used to obtain an award.

In 1990, the awards presentation and dinner were held at the Pan Pacific Hotel in Vancouver, B.C., with 200 guests attending. The awards were presented by Mr. John Allan, Deputy Minister of Energy, Mines and Petroleum Resources. The banquet and proceedings were chaired by Mr. R.W. McGinn, Chief Inspector of Mines. The event was organized to coincide with Mining Week in British Columbia, held at the same hotel.

The winners in 1990 were as follows:

The "A" Trophy was awarded to Minnova Inc., Samatosum Mine; Construction Aggregates Ltd., Baymag Mines Ltd., and Westroc Industries Ltd., who all achieved an accident frequency rate of 0.

The "B" Trophy went to Westmin Resources Ltd.'s Premier Gold Project which also achieved a zero accident frequency rate.

The "C" Trophy was awarded to Highland Valley Copper Ltd., for an accident frequency rate of 9.34, with 2,354,949 man hours accumulated in 1990.

Certificates of Achievement were awarded to:
- Central Aggregates Ltd.,
- Carr Sand and Gravel Delivery Ltd.,
- Queenstake Resources Ltd.,
- Domtar – Lussier Quarry
- Blackham's Construction
- Plateau Construction Ltd.
- Bay Concrete
- Hub City Paving Ltd.

5.5.4. First Aid Competitions

In 1976 a three-person first aid team became the competitive standard, and the first Provincial Three-Persons Miners' First Aid event was held in 1978. First aid training is designed to aid a fellow worker in the event of an accident at the workplace; thus, the competition simulates this situation. One team member acts as the patient and the other two render first aid. The St. John Standard course was adopted as the training standard and only those who work in or about a mine are permitted to enter.

In 1990, first aid competitions were held by the East Kootenay, South/Central and North Mine Safety Associations. First and second place teams went on to compete in the Provincial Competition. The winners in 1990 were as follows:

East Kootenay Mine and Industrial Safety Association:
- Westar Mining Ltd., Greenhills Operation
- Westar Mining Ltd., Balmer Operation

South/Central B.C. Mining Association:
- BHP-Utah Mines Ltd.,
- Brenda Mines Ltd.,

North B.C. Mine Safety Association:
- Quintette Coal Ltd.,
- Equity Silver Mines Ltd.

The Provincial First Aid Competitions were held in Nanaimo on June 16, 1990 in conjunction with the Provincial Mine Rescue Competitions. The Provincial winner was Westar Mining Ltd., Greenhills Operation.

5.5.5. John T. Ryan Trophies

The John T. Ryan safety trophies were established in 1941 by the Mine Safety Appliance Company of Canada Limited to promote safety in Canadian metalliferous and coal mines. The administration of these annual awards is conducted by the Canadian Institute of Mining and Metallurgy.

There have been a number of changes in the regulations and qualifications over the years; however, there are now three categories open for annual competition.

1. Metalliferous Underground Mines – includes a Canadian trophy and four regional trophies. B.C. mines compete in the B.C. and Yukon Region.

2. Select Mines - includes open pit and strip mines for any mineral including coal. This has a Canadian trophy and two regional trophies. B.C. mines compete in the Western Region which includes all Canada west of the Manitoba-Ontario border.

3. Coal Mines - restricted to underground mines. There is a single Canadian trophy in this category.

Applications for these awards are submitted annually through the Chief Inspector of Mines. Awards are presented to the company or companies having the least number of compensable accidents in a continuous period in which 500,000 man-hours (120,000 for underground coal mines) of employment are recorded. If the 500,000 man-hours cannot be achieved in one year, they may be accumulated over a longer continuous time period but the complete calendar year must be included. No portion of that period may be used in another application for the same award. A fatality causes automatic disqualification for the period in which it occurs.

In 1990, trophy winners were as follows:

Select Mines, Canadian Trophy:
- Two co-winners each with a zero frequency rate:
  - International Minerals and Chemical Corporation (Canada) Ltd.,
    K1 Mine, Esterhazy, Saskatchewan.
  - Westmin Resources Ltd.,
    Premier Gold Project, Stewart, British Columbia.

Select Mines, regional trophy:
- Potash Corporation of Saskatchewan, Rocanville Division.

Metalliferous Underground Mines, regional trophy:
- No trophy awarded in 1990.

5.6. EXAMINATIONS AND CERTIFICATIONS

5.6.1. Shiftboss Certificates

Section 24 of the Mines Act requires that every person employed underground or in open pit workings must be under the daily supervision of an official who is the holder of a shiftboss certificate issued under the Act. In addition, section 32 of the Mines Act specifies that every person employed in open pit workings at a coal mine be under the daily supervision of a shiftboss or other official who is the holder of an open pit shiftboss certificate issued under the Act.

An applicant for a shiftboss certificate must hold a non-restricted blasting certificate (gravel pits excluded), a mine rescue certificate (surface or underground as requisite), and a currently valid first-aid certificate. The applicant must also pass an examination on the rules and regulations contained in the respective Acts.

Four different certificates are issued: for underground metal mining operations; for open pit coal mining operations; for open pit metal mining operations; and for sand-, gravel- and clay-removal operations. A fee of $50 is charged for the examination and the passing grade is 65%. Provisional certificates may be issued on a one-time basis for a period of six months.

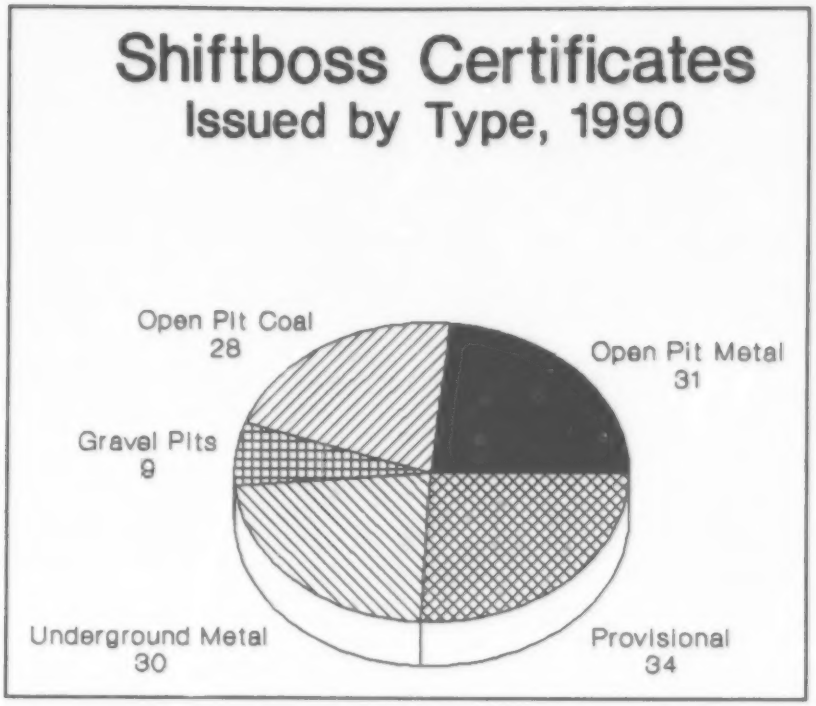
Certifications for 1990 are detailed in the following tables.

Total Shiftboss Certification Activity, 1990

Activity	Number
Applications received	124
Examinations written	101
Number passed	88
Number of permanent certificates issued	98

Shiftboss Certificates Issued by Type, 1990

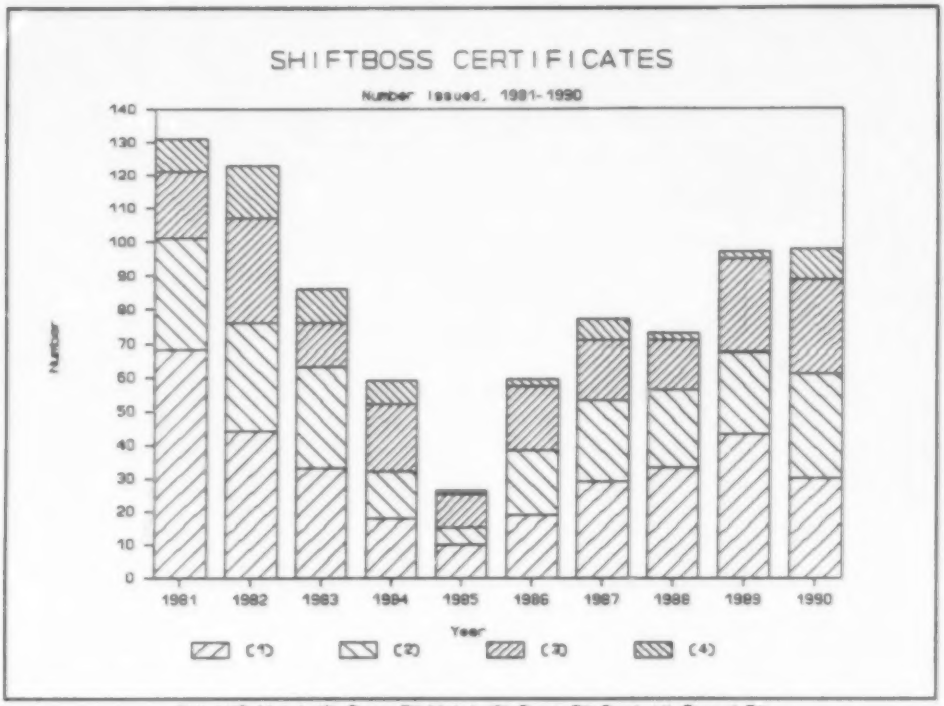
Type of Certificate	Number Issued
Underground metal	30
Open pit metal	31
Open pit coal	28
Gravel pits	9
Provisional certificates	34



The following Shiftboss Certificates were issued during the period 1981 to 1990.

Shiftboss Certificates issued by Type, 1981-1990

Type of Certificate	Year									
	81	82	83	84	85	86	87	88	89	90
Underground metal	68	44	33	18	10	19	29	33	43	30
Open pit metal	33	32	30	14	5	19	24	23	24	31
Open pit coal	20	31	13	20	10	19	18	15	28	28
Gravel pits	10	16	10	7	1	2	6	2	2	9
Total	131	123	86	59	26	59	77	73	97	98



7(1) U/G Metal, (2) Open Pit Metal, (3) Open Pit Coal, (4) Gravel Pit

5.6.2. Certificates of Competency

Sections 32, 33 and 34 of the *Mines Act* require that managers and certain other supervisory officials at underground and open pit coal mines shall be holders of Certificates of Competency issued under this Act. A Board of Examiners, appointed by the Minister, is responsible for setting examinations for these certificates from time-to-time, for considering applications, for interchange certificates, and for issuing certificates.

Certificates are issued in accordance with section 35 of the Act. The certificates and corresponding fees are as follows:

First Class Certificate of Competency-Underground $100.00
Second Class Certificate of Competency-Underground ..... $ 75.00
Third Class Certificate of Competency-Underground ..... $ 50.00
Mine Surveyor Certificate $100.00

In 1990, one Third Class Certificate of Competency was issued to Mr. Mike Savero. No other certificates were issued.

5.6.3. Board of Examiners

The Board of Examiners, comprised of the Chief Inspector as chairman and two other inspectors appointed by the Minister as members, is responsible for examining applicants and issuing Shiftboss Certificates and Certificates of Competency.

Pursuant to the *Mines Act*, the Board sets standards for the examination of applicants for Shiftboss Certificates, Certificates of Competency for coal mines, and Supervisor Certificates. In 1990, R.W. McGinn chaired the Board, while R. Bone and E. Sadar were members, with R. Booth and B. Good as alternates.

PART 6: ACCIDENTS AND INCIDENTS

6.1. FATAL ACCIDENTS

There were five fatal accidents in the British Columbia mining industry in 1990. Four of these fatalities occurred at underground mines. However, it should be noted that none were caused by explosion or falls of ground, which were previous typical threats at underground mines, but rather by faulty interaction with heavy equipment or machinery.

1) A drill operator, **Terrance Brian Matchem** (30 years old), was fatally injured on **March 28, 1990**, while operating a three-boom jumbo drill on the 2300 level at the **HW Mine** of Westmin Mines Ltd. Mr. Matchem was found with parts of his clothing and long hair wrapped around the middle boom drill. Cause of death was believed to be strangulation.

   An inquest into the accident was held June 20, 1990 and the jury's recommendations are as follows:

   - "That the shiftboss or supervisor does not leave the underground work site until all employees under his care and supervision are cleared from their working areas.
   - Before proceeding to the drill work face all drilling operation will cease.
   - Improve lighting on jumbo drill work areas.
   - Current safety regulation handbook should be updated and distributed annually to all employees.
   - Supervisors are to be adequately trained in safe operation of all equipment under their responsibility.
   - All safety regulations - both in the *Mines Act* and those initiated by the company, should be strictly enforced with particular attention to Section 262(3) of the *Mines Act* Regulations.
   - An annual safety audit be conducted as a measure of the effectiveness of the safety program."

2) A scooptram operator, **Noel H. Lariviere** (28 years old) was fatally injured on **April 10, 1990**, while operating an ST-3 scooptram in a development heading on the 1800 level of the **HW Mine** of Westmin Mines Ltd.

   During the mucking out operation of the heading, Mr. Lariviere was attempting to manoeuvre past a parked dump truck which he was loading. The scooptram struck the rear corner of the dump truck which entered under and into the protective canopy of the scooptram, pinning him against the back panel of the cab. Mr. Lariviere received severe crush injuries and died while being evacuated by helicopter to the hospital.

   The Coroner's recommendations were that the mine seek consultation with the Workers' Compensation Board on assistance re heavy equipment safety use; that the Ministry develop and implement a training seminar explaining the purpose and intent of Section 1.10 of the Health, Safety and Reclamation Code; and, that a copy of all safety/accident reports be forwarded to the Joint Health and Safety Committee.

3) Mine geologist **Kenneth William Brown** (26 years old) died on **May 13, 1990** when he fell in the ore pass at the Cheni Gold Mines Ltd. **AGB Mine**.

The preliminary report indicated that Mr. Brown was probably unconscious after the fall and that death was by suffocation after he was pulled into the ore.

It is recommended that no work inside the stop block be undertaken without the use of a safety line.

4) A haulage truck driver, **Tim Jasper** (28 years old) was killed at 2:00 a.m., on **June 26, 1990** at Fording Coal Ltd.'s **Fording River** operation, when his loaded 170-tonne Wabco truck backed through a sidewall berm on a haulage road and rolled downhill.

A crew was raising the haul road near the Clode Pit, and the trucks were normally dumping in the middle of the road. Material was being spread by a dozer and grader. Mr. Jasper had made eight or nine trips and was on the seventh hour of work when the incident occurred.

For some unknown reason, Mr. Jasper backed his truck up to the berm and began dumping. The dozer operator stopped him from dumping, walked over to the truck and signalled the operator to move forward. Mr. Jasper put the truck in reverse and backed the truck through the berm, rolling downhill 150 metres. There were several witnesses to the incident.

A joint Occupational Health and Safety Committee investigation was unable to determine why Mr. Jasper backed up; however, they concluded that the standard signal system used may be inadequate and confusing, especially due to poor visibility under night time conditions.

5) A truck driver, **Joseph Edward Hennigar** (29 years old) was fatally injured on **August 31, 1990** at the **Cassiar** mine site, when he was struck by a falling rope saddle beam assembly as it was being unloaded from a "high-boy" trailer.

Mr. Hennigar was standing on the deck of the truck-trailer as the third of four beams was being lifted from the high-boy to a ground position. As the third beam was being raised, it touched the fourth beam, causing it to roll to the outside and off the trailer. Mr. Hennigar either slipped or attempted to jump clear of the falling beam, however he landed on his back with his legs under the trailer, and the beam fell upon him.

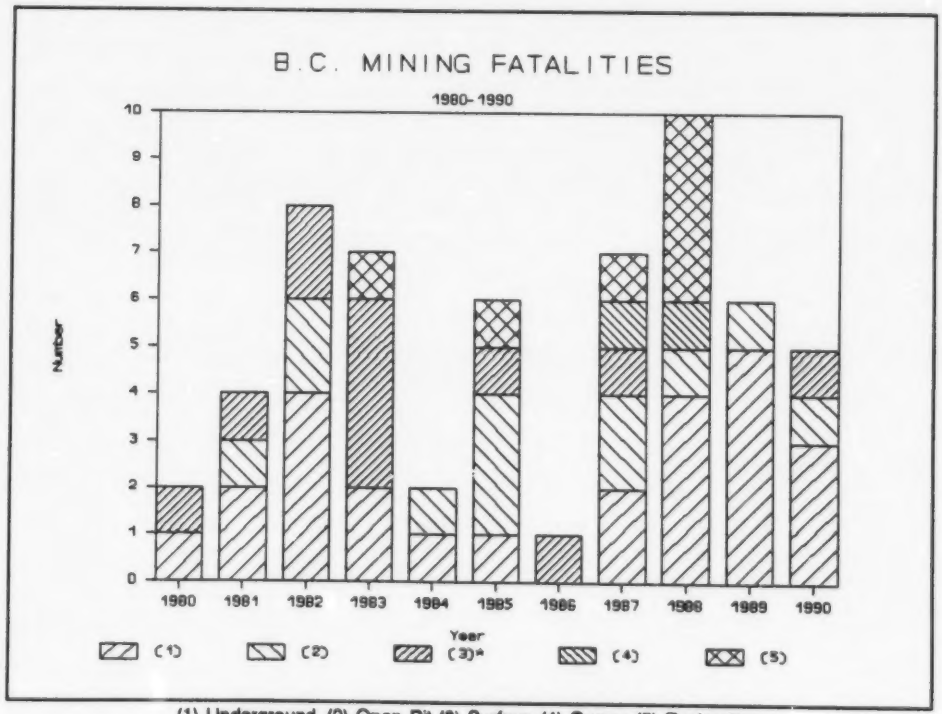
CPR was administered to Mr. Hennigar three times until he started to breathe on his own. However, he died en route from Cassiar Hospital to Dease Lake, where a medi-vac flight had been waiting to airlift him to a Vancouver hospital.

As a result of this accident, the Inspector recommended that a procedure for unloading flatdeck trucks be developed which necessitates the removal of a personnel to a safe location after the load has been hooked up to the crane or device to be used to unload the truck.

British Columbia Mining Fatalities
1980–1990

	Underground	Open Pit	Surface*	Quarry	Exploration	Total
1980	1	0	1	0	0	2
1981	2	1	1	0	0	4
1982	4	2	2	0	0	8
1983	2	0	4	0	1	7
1984	1	1	0	0	0	2
1985	1	3	1	0	1	6
1986	0	0	1	0	0	1
1987	2	2	1	1	1	7
1988	4	1	0	1	4	10
1989	5	1	0	0	0	6
1990	3	1	1	0	0	5
Totals (#)	25	12	12	2	7	58
Totals (%)	43.1%	20.7%	20.7%	3.4%	12.1%	100.0%

* Includes surface facilities, roads, etc.



(1) Underground (2) Open Pit (3) Surface (4) Quarry (5) Exploration
* Surface includes buildings, roads and other surface facilities.

6.2. ACCIDENTS CAUSING DEATH OR INJURY

The accident frequency rate at mines is reported as the number of lost workday accidents/200,000 exposure hours. In 1990 this rate averaged 6.44 for all operating mines and 6.73 for mineral exploration projects. This is a slight increase over 1989. Note that, for the sake of reporting continuity, the accident frequency rate is that quoted by the Mining Association of British Columbia. The rate given below for producing mines (6.42) is slightly different as a result of the exclusion of some smaller mines from this publication.

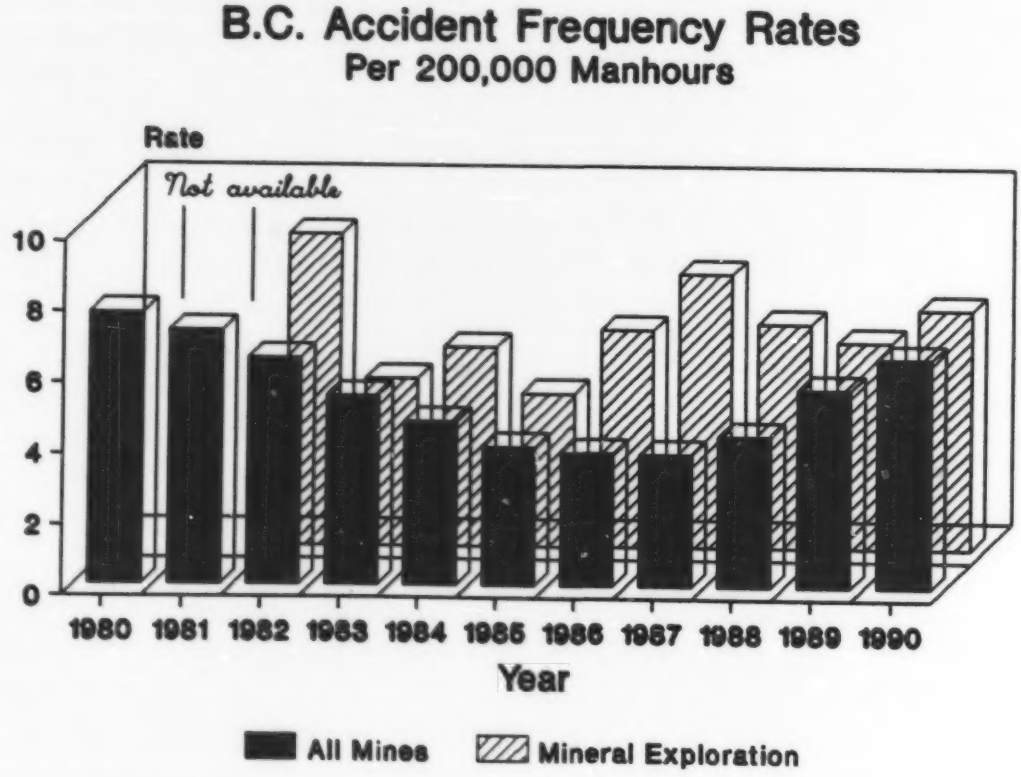
B.C. Accident Frequency Rate by Company, 1990

Company	Hours Worked	Freq. Rate	No. Accidents	Severity Rate	Days Lost
UNDERGROUND					
Blackdome*	143,555	26.47	19	403	289
Cheni	300,488	17.97	27	4,700	7,062
Golden Bear	226,722	13.23	15	331	375
Sullivan	640,744	14.05	45	268	857
Beaverdell	62,206	25.72	8	334	104
Myra Falls	1,119 391	11.97	67	2,366	13,241
TOTAL U/G	2,493,106	14.52	181	1,759	21,928
OPEN PIT					
Afton	411,358	7.78	16	154	316
Bell	636,661	0.94	3	33	105
Brenda	395,683	3.03	6	101	199
Cassiar	686,533	6.70	23	36	125
Endako	472,269	0.42	1	9	21
Equity	368,865	0.54	1	15	28
Gibraltar	678,736	3.83	13	41	139
Highland Valley	2,354,949	1.87	22	45	527
Island Copper	1,174,228	5.45	32	45	264
Nickel Plate	361,620	1.11	2	9	16
Samatosum	185,607	0.00	0	0	0
Similco	688,186	13.95	48	302	1,039
Premier	354,483	0.00	0	0	0
TOTAL OPEN PIT	8,769,178	3.81	167	63	2,779
TOTAL METAL AND ASBESTOS	11,262,284	6.18	348	439	24,707

Company	Hours Worked	Freq. Rate	No. Accidents	Severity Rate	Days Lost
COAL					
Balmer	2,716,392	8.10	110	191	2,598
Quinsam	135,825	17.67	12	125	85
Bullmoose	688,094	1.74	6	13	44
Byron Creek	577,775	7.96	23	132	380
Crows Nest	995,440	3.42	17	114	567
Fording	1,789,503	8.05	72	852	7,620
Greenhills	1,227,088	8.15	50	126	775
Quintette	2,9[illegible]9,305	5.36	79	40	584
TOTAL COAL	11,079,422	6.66	369	228	12,653
ALL MINES	22,341,706	6.42	717	334	37,360

* To July, 1990.

Fluctuations in the accident frequency rate over the past decade are shown in the following graph:

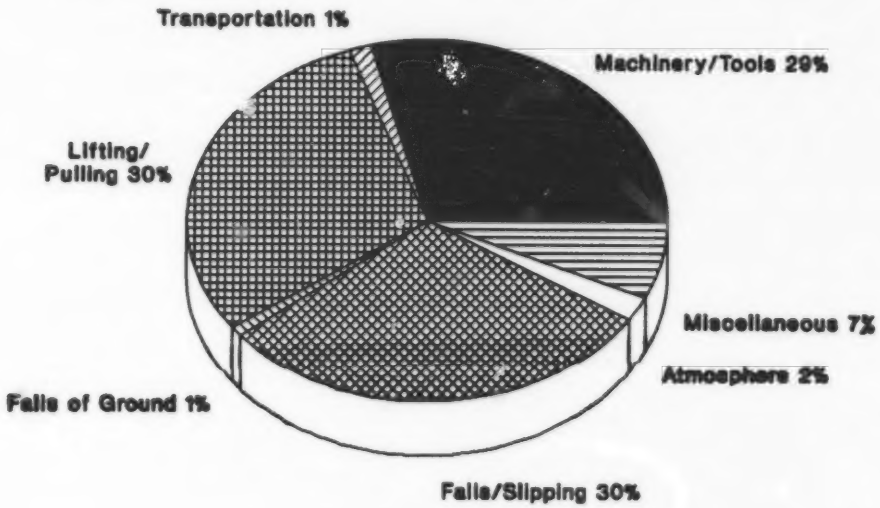


The following tables classify the accidents causing death or injury that were reported to the Branch by cause, occupation and parts of the body injured.

Accidents causing Death or Injury Classified by Cause, 1990

Cause	Number of Accidents	Percentage
Atmosphere	12	2.20
Explosives	0	0.00
Falls of Ground	5	0.92
Falls/Slipping of Persons	164	30.15
Lifting/Pulling/Handling Material	161	29.60
Machinery and Tools	157	28.86
Transportation	8	1.47
Miscellaneous	37	6.80
Totals	544	100.00

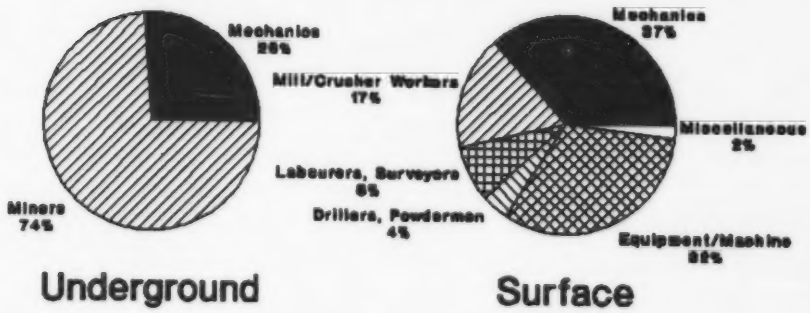
Accidents Causing Death or Injury
Classified as to Cause, 1990



Accidents causing Death or Injury
Classified by Occupation of those Injured, 1990

Occupation	Number of Accidents	Percentage
UNDERGROUND		
Miners	48	73.8
Mechanics (Electricians, Supplymen, Welders, etc.)	17	26.2
TOTAL UNDERGROUND	**65**	**100.0**
SURFACE		
Mechanics, Electricians, Repairmen	174	36.5
Mill and Crusher Workers	81	17.0
Labourers, Surveyors, Construction, etc.	39	8.3
Drillers, Powdermen	21	4.0
Equipment/Machine Operators	154	32.2
Miscellaneous	10	2.0
TOTAL SURFACE	**479**	**100.0**
TOTAL UNDERGROUND AND SURFACE	**544**	**100.0**

Accidents causing Death or Injury
Classified by Occupation, 1990



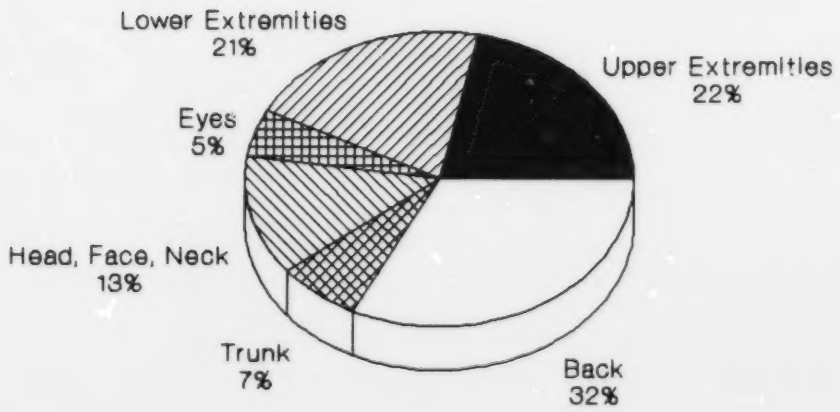
Accidents causing Death or Injury
Classified as to Parts of the Body, 1990

Location	Number of Accidents*	Percentage**
Eyes	32	5.2
Head, Face, Neck	81	13.1
Trunk	43	7.0
Back	199	32.3
Upper Extremities	134	21.8
Lower Extremities	127	20.6
General	0	0.0
Totals	644	100.0

* Total number of times each part of the body was injured. More than one part of the body may be injured in each accident, so the total number is greater than that shown in the previous two tables.

** Percentage of total accidents.

Accidents causing Death or Injury
Classified by Parts of the Body, 1990



6.3. DANGEROUS AND/OR UNUSUAL OCCURRENCES

Section 1.7.1 of the *Mine Health, Safety and Reclamation Code* requires the mine manager to report all accidents causing loss of life or serious personal injury, or any dangerous occurrence, within 16 hours of the incident to the Occupational Health and Safety Committee, the Chief Inspector or the relevant District Inspector, and the local union or employee association. Within one week, the manager is required to follow up with a written notification to the Chief Inspector and District Inspector. On completion of an investigation the manager must prepare a report on the incident and forward a copy to the relevant parties noted above.

The Engineering and Inspection Branch studies these occurrences and distributes information. It has been established that the detailed study of such occurrences and the dissemination of information about their causes, helps to reduce accidents. Condensed summaries of all occurrences are compiled and issued periodically by the Branch. During 1990, a computerized database was designed so that historic and current dangerous and/or unusual occurrences could be entered for purposes of reporting and data manipulation. Preliminary output from this database should be available for the 1991 branch annual report.

6.4. PROSECUTIONS

Information was laid regarding two charges against Mr. W. Inverarity for failing to apply for and receive an explosives storage and use permit and failing to remove the explosives prior to closure of the mine at the Steam Boat mineral property near Radium, B.C. No further action was taken in 1990.

Kokanee Explorations Ltd., of Cranbrook was charged with commencing work in or about a mine without having obtained a permit from the Chief Inspector. The December court date was rescheduled for 1991.

6.5. BLASTING CERTIFICATE SUSPENSIONS

A single blasting certificate suspension occurred in 1990. Mr. George Leask contravened Section 8.6.2(1) of the *Mine Health, Safety and Reclamation Code,* which reads:

> 8.6.2 "Before blasting, the blaster, or person designated responsible for blasting shall...
>
> (1) clear the blast danger zone of all persons."

Mr. Leask's blasting certificate was suspended for a period of 28 days.